The Heating and Ventilating Magazine

A MONTHLY JOURNAL of ENGINEERING PROGRESS

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JANUARY 1920

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New York Office, 1123 Broadway

Dole

DOLE

Packless-Ball-Bearing-Graduated

VALVE

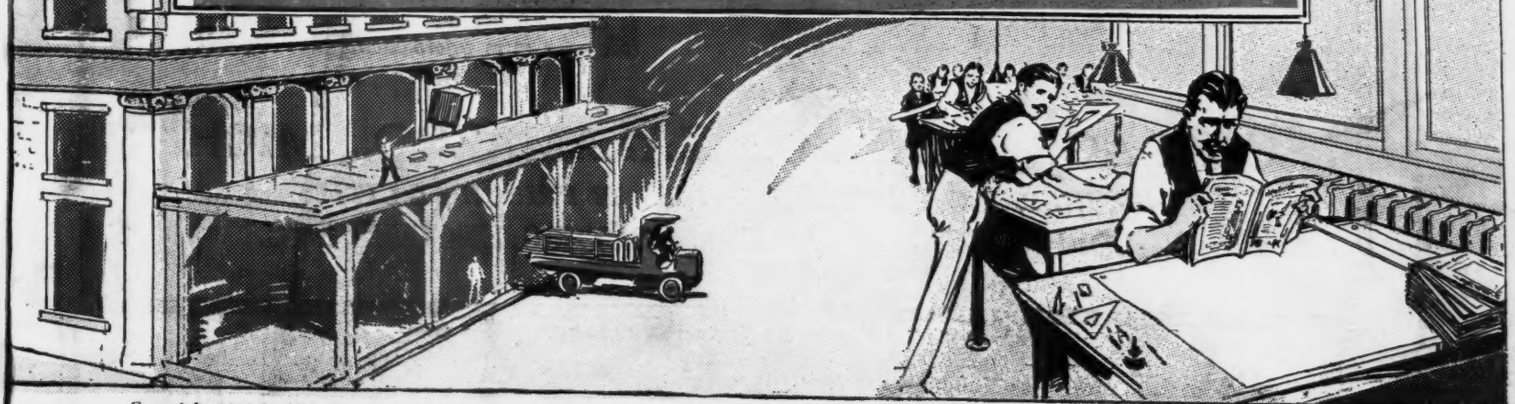
—the valve that gives absolute control of the Vacuum or Vapor Steam Heating System. Scientifically built and easily understood—any degree of heat can be obtained with less than half a turn of the handle.

Instantaneous adjustment with steam on—A special wrench furnished with every order for DOLE VALVES permits any necessary adjustment *after* valve has been installed—this is typical of DOLE advancement in modulated valve construction—no other valve on the market possesses that feature.

Write us now for the DOLE catalog showing the complete line of DOLE VALVES.

THE DOLE VALVE COMPANY
Chicago, Ill.

The Finality in Accuracy and Precision



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CLARAGE
KALAMAZOO

RIGHT NOW! The value of fresh, pure air is more apparent, to the average man, than ever before. People are awakening to the fact that Public Buildings and Factories are in dire need of proper ventilation. The time is ripe for the Engineer and Contractor to specify and install complete systems for ventilating and heating. This is profitable business and at the same time you are rendering a valuable service to your community.

Clarage Fan Apparatus for ventilating and heating is applicable to all types of buildings and for all conditions of operation. The equipment may be installed in old buildings as well as new—without costly alterations.

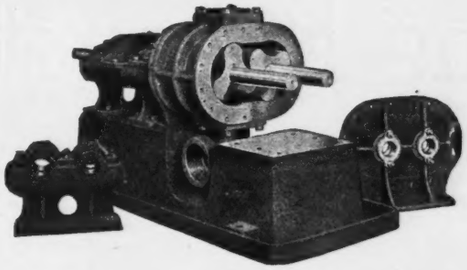
—And by specifying "Clarage" you are as certain of good quality as though you had specified "Sterling" on silver.

Our Engineering Department is at your disposal. Write today for more information.

CLARAGE FAN CO., KALAMAZOO, MICH.

ENGINEERING AND SALES OFFICES IN PRINCIPAL CITIES

BUILDERS OF FANS, BLOWERS, HEATERS, ENGINES, ETC.



We have a pardonable pride in the class of buildings which Connersville Valveless Vacuum Pumps are serving.

The No. 12H bulletin contains a representative list of installations and gives many reasons why this is the logical pump for return line vacuum heating work.

Bulletin also shows how the piping should be arranged under different conditions and will materially aid you in properly laying out a system.

Ask for your copy today.

The Connersville Blower Company

Connersville Indiana U.S.A.

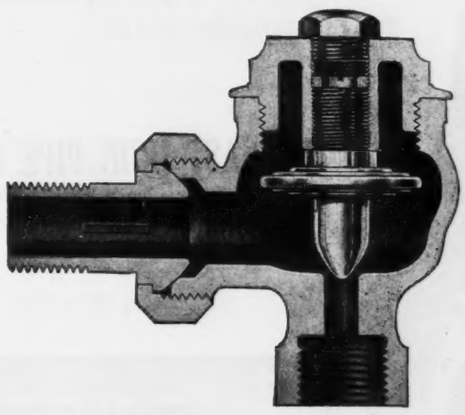
Chicago, Monadnock Block New York, 114 Liberty Street

Marsh Reflux Junior Thermostatic Traps

For Radiators and Coils of "Low Pressure," "Vapor" and "Vacuum Heating Systems"

FREELY DISCHARGES AIR AND WATER WITHOUT LOSS OF STEAM

THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor or vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**



The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job. Especially adaptable for two pipe gravity work and vapor systems.

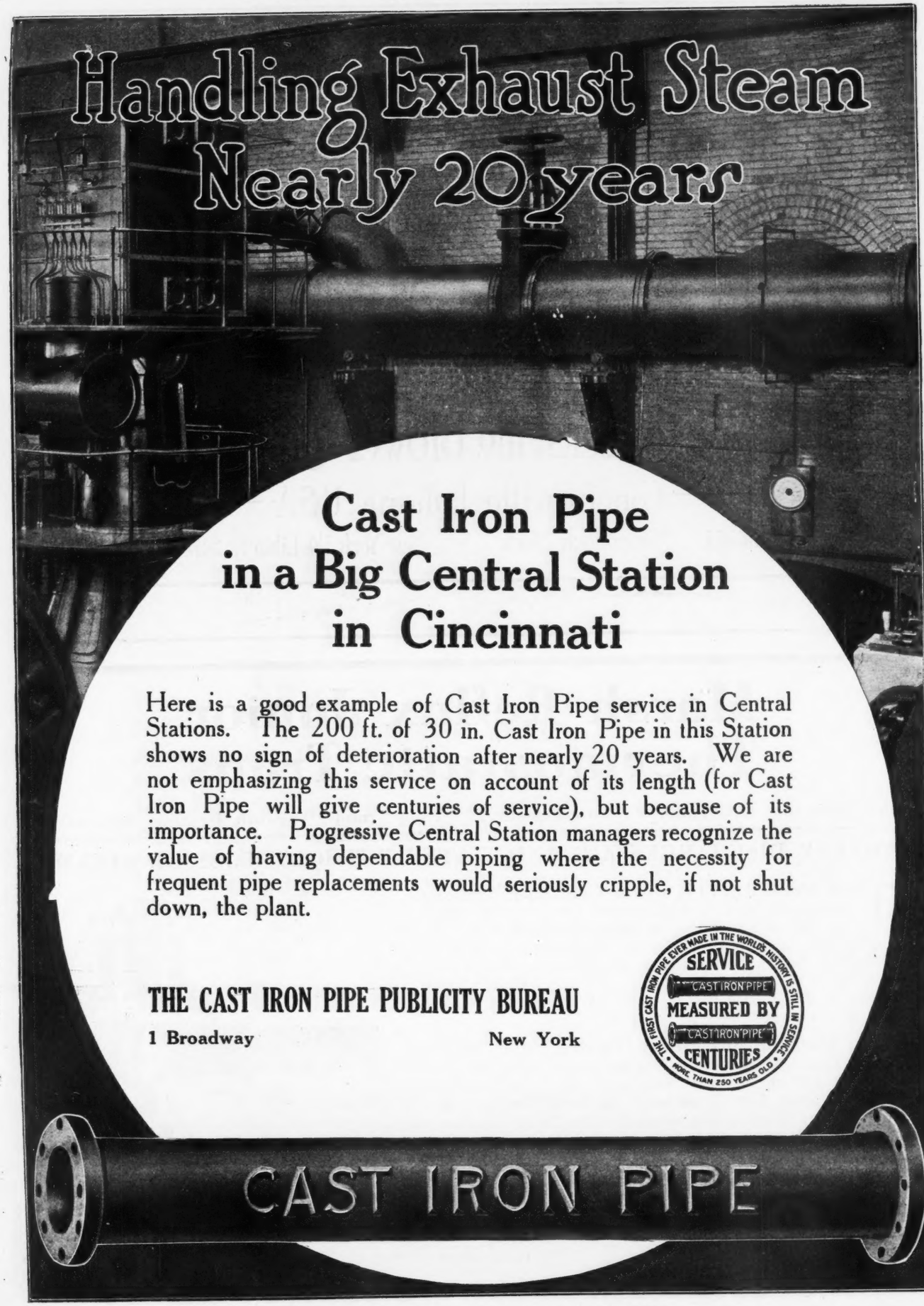
May be furnished either outside adjustment (as illustrated) or with concealed adjustment.

Write for literature fully describing this Trap

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

Founded 1865

Manufacturers of Gauges for all Pressures **Automatic Air Valves and Steam Specialties**



Cast Iron Pipe in a Big Central Station in Cincinnati

Here is a good example of Cast Iron Pipe service in Central Stations. The 200 ft. of 30 in. Cast Iron Pipe in this Station shows no sign of deterioration after nearly 20 years. We are not emphasizing this service on account of its length (for Cast Iron Pipe will give centuries of service), but because of its importance. Progressive Central Station managers recognize the value of having dependable piping where the necessity for frequent pipe replacements would seriously cripple, if not shut down, the plant.

THE CAST IRON PIPE PUBLICITY BUREAU

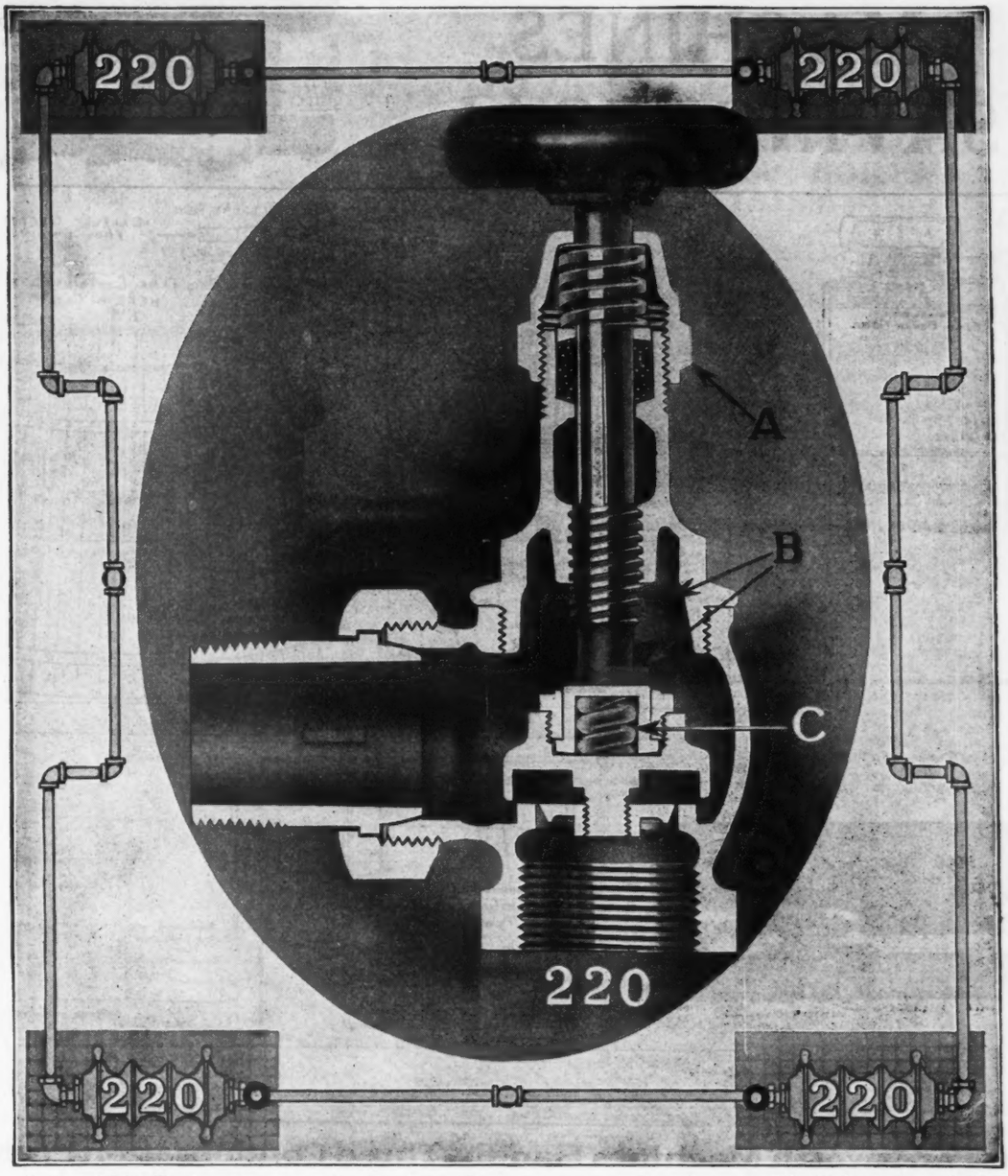
1 Broadway **New York**

THE FIRST CAST IRON PIPE EVER MADE IN THE WORLD'S HISTORY IS STILL IN SERVICE
SERVICE
CAST IRON PIPE
MEASURED BY
CAST IRON PIPE
CENTURIES
MORE THAN 250 YEARS OLD

CAST IRON PIPE

The Perfect Radiator Valve

CRANE – 220



A—Special Stuffing Box is always tight. B—Crane Patent Stop prevents jamming. C—Disc Spring prevents leaks.

The Stuffing Box is specially designed for radiator valve service. It is not packless but it will outlast and stay tight longer than any other stuffing box irrespective of the design, name or packless features.

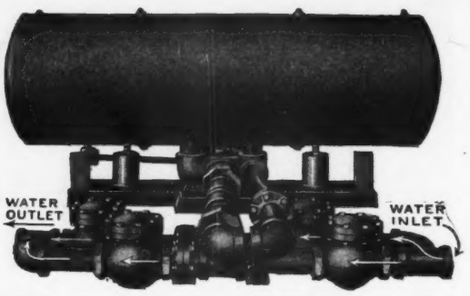
Use it on any steam, vapor or vacuum job.

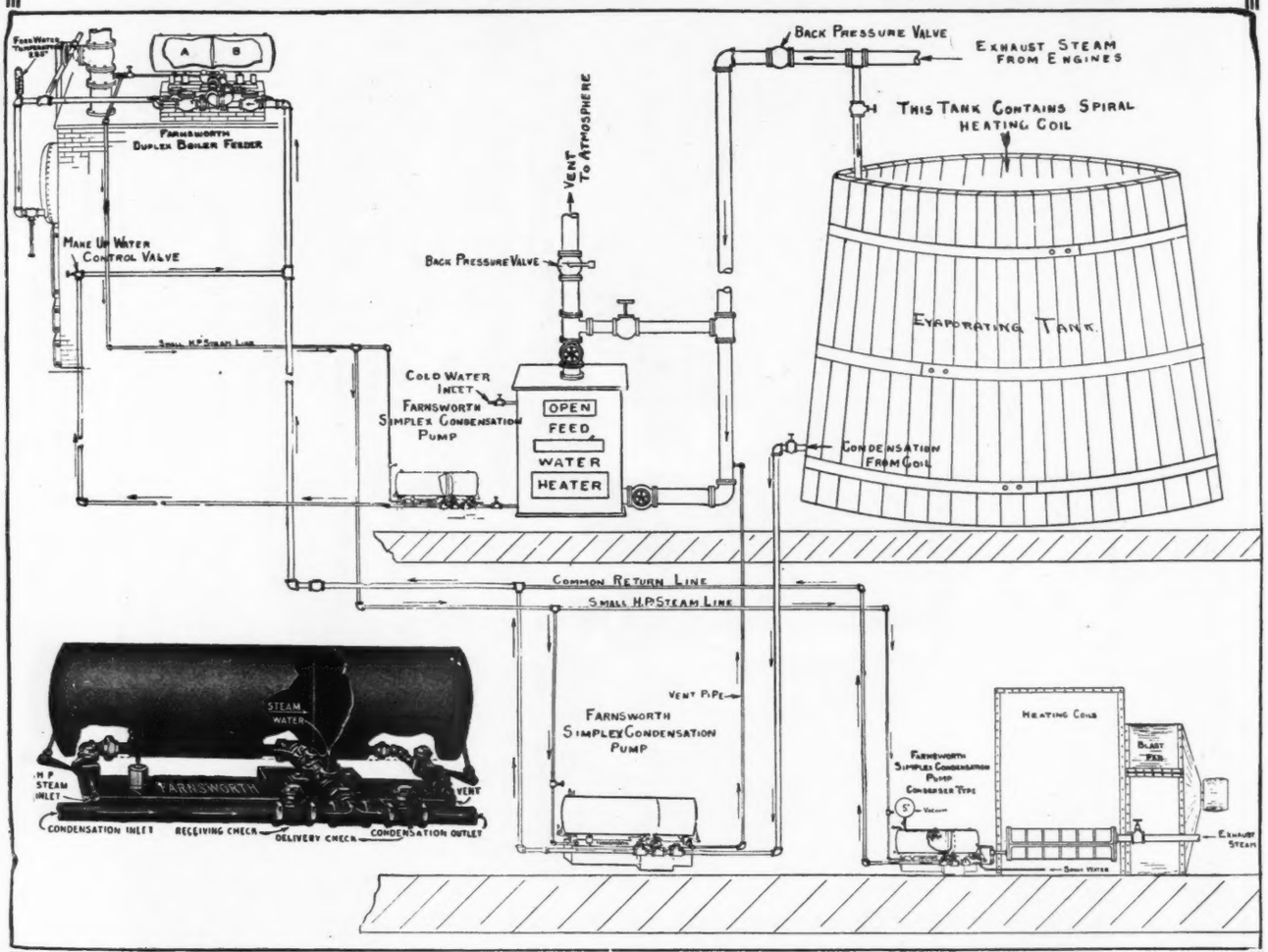
1855 —— CRANE CO. —— 1919

836 South Michigan Avenue
Chicago

Branches in 56 leading cities.

FARNSWORTH MACHINES SAVING COAL





How Farnsworth Machines Handle Three Condensation Problems

The above illustration shows how the Farnsworth Closed System is handling condensation in three conditions to save coal and increase production. The Farnsworth Duplex Boiler Feeder and its continuous, automatic operation has been fully explained in recent "ads" in "The Heating and Ventilating Magazine." The low pressure condensate from the evaporating tank or any other heated apparatus is drained into the Farnsworth Simplex Condensation Pump through the receiving valves and this tank is equalized with the return line that it is draining. As the tank fills it oscillates and automatically opens a small high pressure steam valve which applies high pressure steam to the top of the tank and forces the low pressure condensate through delivery check valve into the common return line leading to the receiving chamber of the Duplex Boiler Feeder.

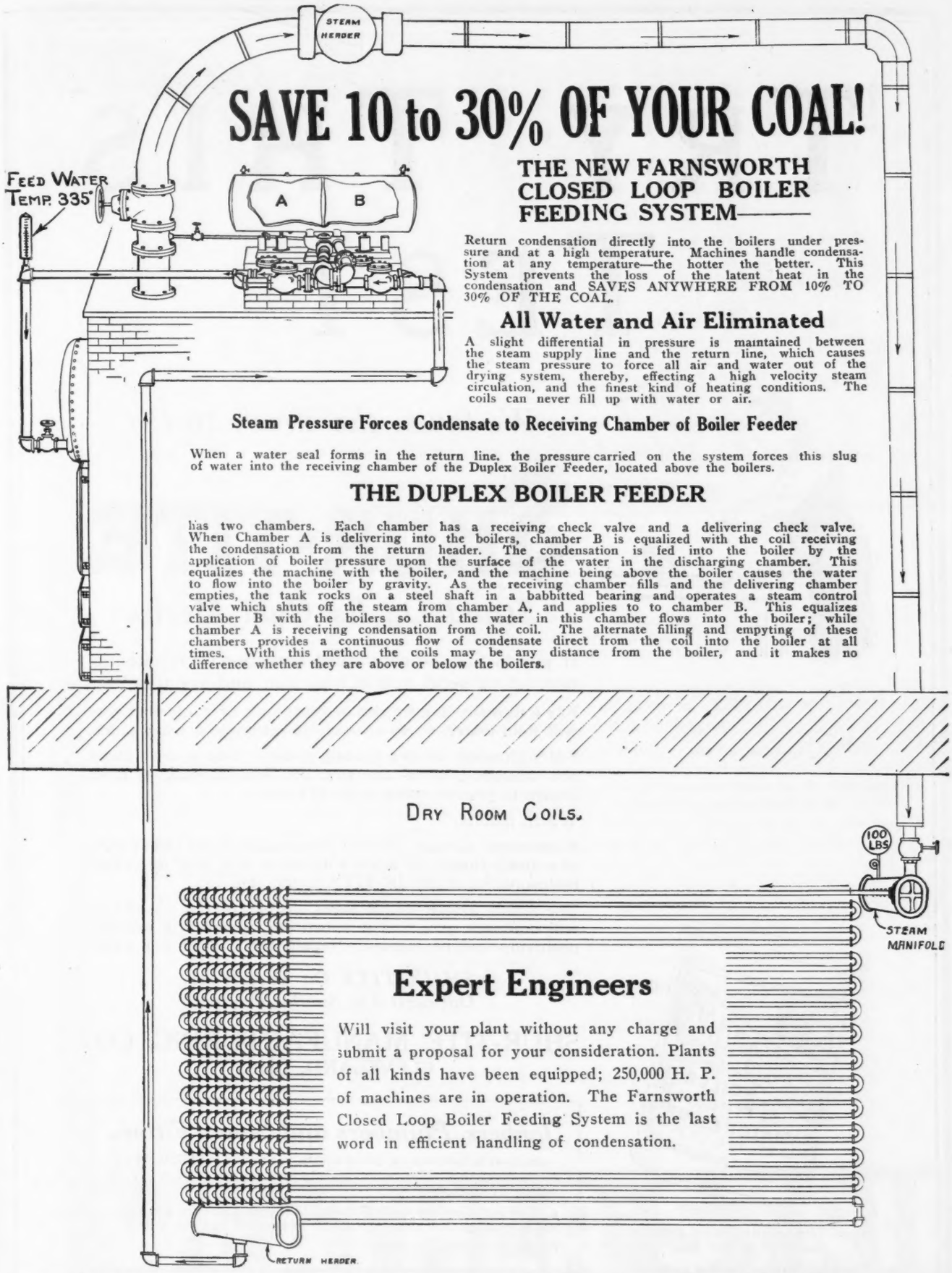
The Farnsworth Simplex Condensation Pump of the condenser vacuum type is draining the blast fan heating coils. This machine has a small cold water spray that condenses the vapors and sets up a high vacuum in the tank which sucks the water out of the heating coils into the tank which, as it fills, oscillates and opens a small high pressure steam valve which forces the condensate into the common return line leading to the receiving chamber of the Duplex Boiler Feeder. By this method a high velocity of steam is forced through the heating fan coils, the return line is kept clear of water, hence better circulation of steam. At the same time the condensate is held under pressure and no heat units are lost.

The Farnsworth Simplex Condensation Pump, taking water from the open feed water heater is the machine that supplies the necessary make-up water for the boiler. In other words, if sufficient condensate is not coming back from the heating system, high pressure traps, etc., this pump delivers the necessary make-up water to the Duplex Boiler Feeder. Note the control valve near the front of the boiler that the fireman opens when he needs more water for his boilers. The heater will not heat the water too hot for this pump to handle; in fact, the hotter the better.

The advantage of this system being that each heated apparatus or heating system is draining independently, thus giving a better circulation of steam and better drying or heating conditions and at the same time the condensate is held under a pressure and fed directly into the boiler under a pressure and at a high temperature.

FARNSWORTH COMPANY *Engineers and Manufacturers of Condensation Pumps*
Conshohocken, Penna.

FAIRBANKS-MORSE & CO., Inc., Agents and Distributors for Pacific Coast
FAIRBANKS-MORSE CO., LONDON, ENG., DISTRIBUTORS



SAVE 10 to 30% OF YOUR COAL!

THE NEW FARNSWORTH CLOSED LOOP BOILER FEEDING SYSTEM——

Return condensation directly into the boilers under pressure and at a high temperature. Machines handle condensation at any temperature—the hotter the better. This System prevents the loss of the latent heat in the condensation and SAVES ANYWHERE FROM 10% TO 30% OF THE COAL.

All Water and Air Eliminated

A slight differential in pressure is maintained between the steam supply line and the return line, which causes the steam pressure to force all air and water out of the drying system, thereby, effecting a high velocity steam circulation, and the finest kind of heating conditions. The coils can never fill up with water or air.

Steam Pressure Forces Condensate to Receiving Chamber of Boiler Feeder

When a water seal forms in the return line. the pressure carried on the system forces this slug of water into the receiving chamber of the Duplex Boiler Feeder, located above the boilers.

THE DUPLEX BOILER FEEDER

has two chambers. Each chamber has a receiving check valve and a delivering check valve. When Chamber A is delivering into the boilers, chamber B is equalized with the coil receiving the condensation from the return header. The condensation is fed into the boiler by the application of boiler pressure upon the surface of the water in the discharging chamber. This equalizes the machine with the boiler, and the machine being above the boiler causes the water to flow into the boiler by gravity. As the receiving chamber fills and the delivering chamber empties, the tank rocks on a steel shaft in a babbitted bearing and operates a steam control valve which shuts off the steam from chamber A, and applies to to chamber B. This equalizes chamber B with the boilers so that the water in this chamber flows into the boiler; while chamber A is receiving condensation from the coil. The alternate filling and empyting of these chambers provides a continuous flow of condensate direct from the coil into the boiler at all times. With this method the coils may be any distance from the boiler, and it makes no difference whether they are above or below the boilers.

Expert Engineers

Will visit your plant without any charge and submit a proposal for your consideration. Plants of all kinds have been equipped; 250,000 H. P. of machines are in operation. The Farnsworth Closed Loop Boiler Feeding System is the last word in efficient handling of condensation.

FARNSWORTH COMPANY

CONSHOHOCKEN, PA.

ENGINEERS AND MANUFACTURERS OF CONDENSATION PUMPS.

TRY THIS TEST

We Invite the Trade to Let

SHUR-TITE

Stand On Its Own Merits

If you would be convinced for your own satisfaction let us send you a trial can and try this test:

File a thin slit in a tin can or receptacle of some sort that will hold water, so as to have it resemble a leaky crack.

Fill with water as in a heating system, then pour in about one tablespoonful of any so-called leak-stopping product known to you, to every quart of water.

Watch results.

Next empty the can. Reopen the crack if it has been partly or entirely closed, fill again with water and drop *one-sixth* tablespoonful of SHUR-TITE in the can.

The action SHUR-TITE takes, visible to your naked eye, will convince you that a substitute, which will quickly, positively and permanently repair leaks, does not exist.

SHUR-TITE On Test Will Outmerit Any Similar Product

SHUR-TITE MANUFACTURING CO.
CLEVELAND, OHIO

Shur-Tite comes sealed tight in this large yellow can.

The best jobbers have it in stock.

Jobbers, Plumbers and Steam Fitters

—the best in the country, *everywhere*, are taking to SHUR-TITE more every day. The better jobbers and dealers have a liberal supply in stock.

And to aid them, we back SHUR-TITE with a special advertising campaign—the most liberal ever offered for any like product.

Better drop us a line today!

How warm should a living-room be?

Sheep in the open, weather storms by forming a close circle and moving as one living mass. Foxes need more comfort and find it in holes. The savage gets protection from cold by slaying his hairy neighbors and burying himself in their skins.

How warm should a living-room of cultured man be?

That's the big question in equipping places to live and work in. Scientists and health authorities have determined it—a uniform temperature of 68 degrees.

"Uniform"—that is 68 degrees near the windows and 68 degrees near the heat radiator. You can get that 68 degrees and keep it only with weather strips—weather strips made right and put in right. Around windows and doors in all houses there is an average crack of 1/8-inch width. Multiply that fraction by the dimensions of the doors and windows in a building and see what a space there is for heat to get out and cold to rush in. Right weather strips seal these cracks. It's easy and economical then to get the uniform 68 degrees.

The Weather Strip Manufacturers' Association is an organization of responsible manufacturers, having a total invested capital of more than $2,000,000, who make right weather strips.

Communicate with one of the following factories and you will be supplied promptly with full information:

Weather Strip Manufacturers' Association

American Metal Weather Strip Co., Grand Rapids, Mich.
Athey Company, Chicago, Ill.
Diamond Metal Weather Strip Co., Columbus, Ohio.
Higgin Manufacturing Co., Newport, Ky.
Kane Company, Kane, Pa.
Monarch Metal Weather Strip Co., St. Louis, Mo.
Niagara Metal Weather Strip Co., Buffalo, N. Y.
Robbins Manufacturing Co., Chicago, Ill.

"Weather Strips are 100% fuel conservation."
—U. S. Fuel Administration.

WEATHER STRIP M'F'RS ASS'N

DEPENDABILITY

The quality which is more than ever desirable in these days of Bolshevism, Labor Troubles, Strikes, and other disturbances.

The possession of this cardinal virtue is much to be desired in men, materials, and merchandise.

The proven knowledge that a product is truly dependable is a veritable anchor to windward on which the harrassed executive may safely rely.

In the steam radiator valve business, one truly dependable product is the

Lavigne Packless Quick-opening Steam Radiator Valve

Steam fitters have used it on all their good jobs for years with the maximum of satisfaction to their customers and themselves.

It positively will not leak Air, Water, or Steam
It opens quickly and closes just as quick
It is handsome in appearance, superbly finished
IT IS BUILT RIGHT - TO STAY TIGHT

Made in six sizes - Many styles of handle

All Good Jobbers Have Them

COMMONWEALTH BRASS CORPORATION
DETROIT, U. S. A.

TRADE P&C CO MARK

PRATT & CADY COMPANY INCORPORATED

ANNOUNCES THE APPOINTMENT OF

MR. E. COIT MAGENS AS DIRECTOR OF SALES

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259 CANAL STREET, NEW YORK CITY

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ALSO THE OPENING OF BRANCH STORES AT

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505 MISSION STREET, SAN FRANCISCO, CAL.,
MR. C. R. MENDELSON, MANAGER

HARTFORD, CONNECTICUT

John Simmons Co.

110 Centre Street, New York

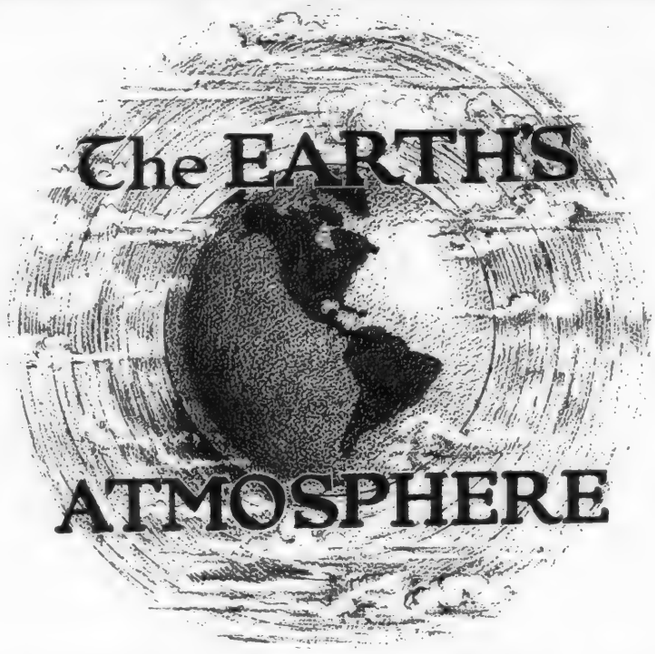
GENERAL EQUIPMENT DISTRIBUTORS

For Steam Fitters, Gas Fitters, Oil Operators, Plumbers and Fire Protection Lines

STEAM SPECIALTIES

"Stickle" Steam Traps, "Morehead" Steam Traps (Back-to-the-Boiler System) Steam and Oil Separators, Open Coil Heaters and Purifiers, Exhaust Heads, Feed Water Heaters, Wall Radiators.

Let Us Put You on Our Mailing List.



embodies elements which in proper combination is ideal for the manufacture of certain products—What is good for one process may be disastrous to another, however.

Investigations by the New York Ventilation Commission and the Chicago Ventilation Commission, associated with the American Society of Heating and Ventilating Engineers, have brought out facts regarding the temperature and relative humidity most healthful to humanity and from tests it has been determined what may be termed the COMFORT ZONE.

While man has no control over the climatic changes which take place from day to day, he has developed means whereby enclosed spaces used for habitation, education, manufacture or amusement can be maintained clean, pure, fresh and healthful.

WEBSTER AIR CONDITIONING APPARATUS can be provided for stabilizing conditions from season to season so that cooling and dehumidifying can be effected in hot, humid summer months, while heating and humidifying in the winter season.

The type of apparatus to be used and the nature of the controlling equipment required is a subject for study of the specific installation.

WE SPECIALIZE IN AIR CONDITIONING and point to our past record as evidence of our ability to design and furnish equipment that will fill every possible requirement.

BEFORE DECIDING - CONSULT US

ATMOSPHERIC CONDITIONING CORPORATION

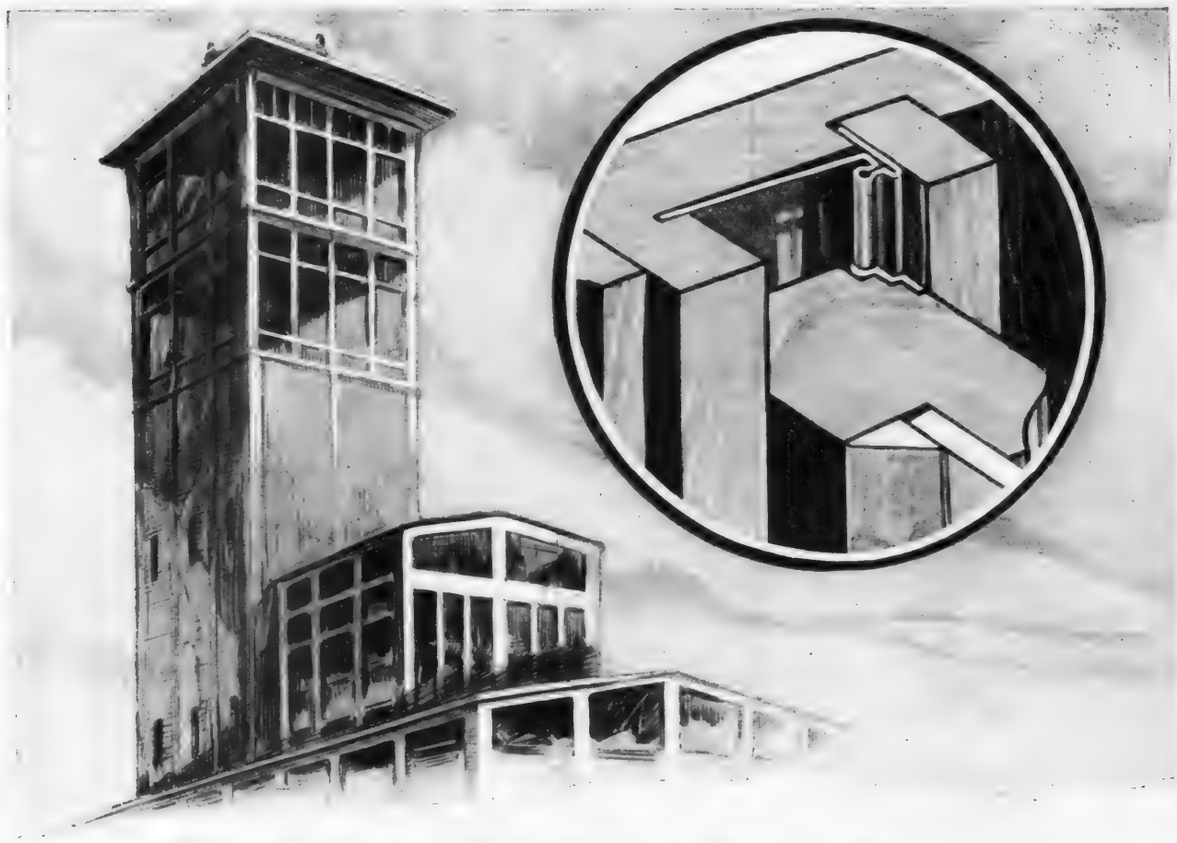
Manufacturers of Equipment for

MAINTAINING ARTIFICIAL ATMOSPHERIC CONDITIONS *in* INDUSTRIAL PLANTS

Webster Air Washers

433 CHESTNUT STREET

PHILADELPHIA



Be Guided By This Shot Tower

The dropping of shot requires that an absolute uniformity of temperature be maintained inside the tower.

The Winchester Arms Company controls the temperature of the air in their tower at New Haven because they equipped its windows with Monarch Metal Weather Strips. Be guided by this shot tower.

With Monarch Strips capable of regulating as delicate a heating problem, as they do in the New Haven Shot Tower, they are certainly sure to give you full control of your heating plant—whether in home, hospital, hotel or business building.

Monarch Strips are your first line of defense against the cold and high coal bills. They protect your rooms from dirt, noise and germs. They are "100% fuel conservation," according to the Government's Fuel Administration—and they hermetically seal heat inside where it belongs, and keep wind, rain and noise outside.

"MONARCH Outstrips 'Em All"

They are two piece, tubular strips—an exclusive Monarch design—one strip acting as a curved track for the other—with play enough between the two to permit easy and noiseless operation of the window—and because of their enterlocking construction, acting as a perfect and permanent seal. Look up "Monarch" in the phone book, or write us for name of our nearest representative. A prompt investigation will pay you in coal and comfort.

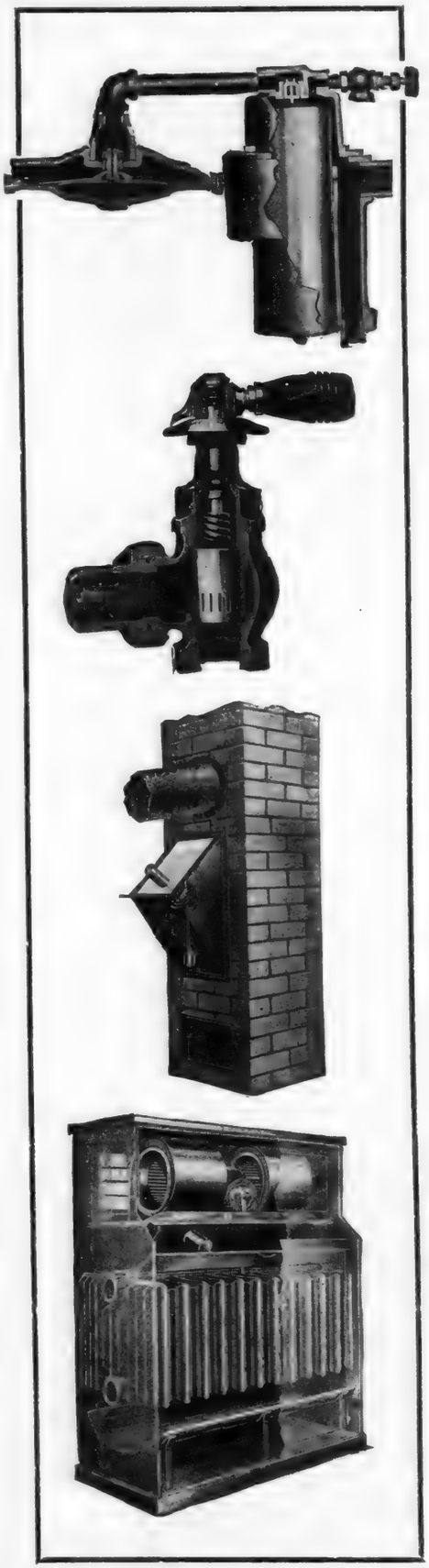
Monarch Metal Weather Strip Co.

5000 Penrose Street **St. Louis, U. S. A.**

Canadian Metal Window Co., Toronto, Canada

Manufacturers also of Casement Window Hardware.

MONARCH
METAL WEATHER STRIPS



WITHOUT QUESTION

–A GOOD LINE of Equipment for YOU to Sell

⊞

Moline Heat

A System of Steam Circulation and Control of Proved Excellence

⊞

Liberty Draft Controller

Controls in the fullest sense of the word. Give it a serious "look-over"

⊞

UNIVENT

The Last Word in Combined Heating and Ventilating. *Guaranteed*

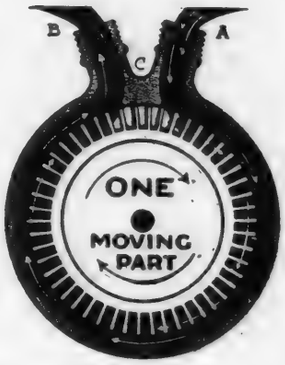
⊞

Write for Complete Line of Catalogs TODAY

Address Dept. F

Moline - Illinois

A Distinct Type of Pump

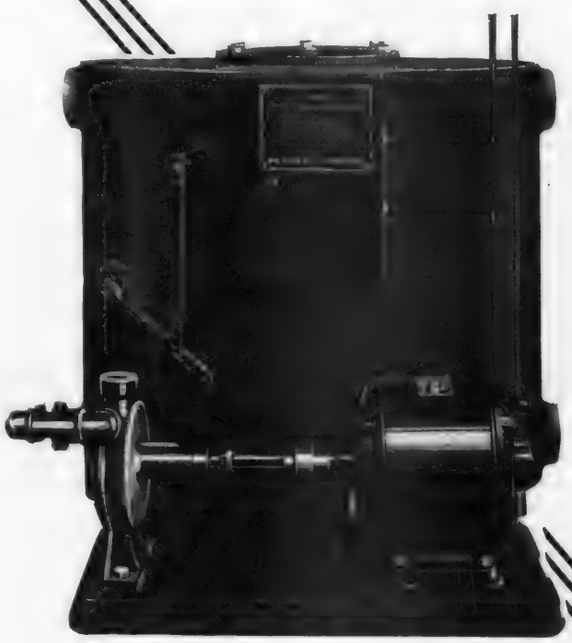


One Moving Part

That is the whole story of Trane Pump simplicity, "One Moving Part." The Trane Pump is in a class by itself. It is different from any other type of pump. It pumps large volumes at low heads and operates positively against high pressures, rivaling in performance both the centrifugal and plunger types of pumps, without the disadvantages or limitations of either.

The impellor or ***one moving part*** is perfectly balanced and free from friction. It handles clear or dirty water equally well. There is nothing to wear, no thrust bearings, gears or complicated parts to ever get out of order or require repairs. The Trane Pump is as dependable in operation as it is distinct and simple in construction.

Trane Condensation Pumps



Trane Condensation Pumps are now regularly furnished in sizes up to 30,000 sq. ft. of radiation and against boiler pressures up to 60 pounds. Larger sizes are furnished on special order.

are money savers and money makers. On the job they prevent waste, save money in fuel and labor, and improve the operation of the entire heating plant. They are simple and easy to install. They mean sure profits and satisfied customers.

Let us co-operate with you on your pumping problems. Trane Engineering Service is FREE,—yours for the asking. We shall be glad to study your requirements and recommend a Trane Pump ***guaranteed*** to meet those requirements. It will pay you to know all about Trane Service and Trane Pumps.

Write today for bulletins and prices

THE TRANE COMPANY

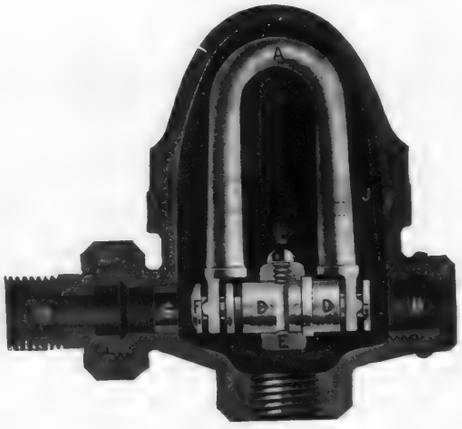
103 S. Sixth St., LA CROSSE, WIS.

Branch Offices:

175 W. Jackson, Blvd., CHICAGO, ILL.

11 John St., New York City

Of Simple and Rugged Construction



With Easy Access to all Parts

Correct Principles

of engineering design are embodied in the

VENTO
AUTOMATIC
Valves and Traps

Is this trap ample power of expansion and contraction is combined with an extreme sensitiveness to temperature variations

✣ ✣

Guaranteed absolutely for a period of 5 years, when used on vacuum or Low-pressure Heating Systems

✣ ✣

WM. S. HAINES & CO.
PHILADELPHIA, PA.

Inefficient Heating Systems in Old Buildings can be Remodeled at Comparatively Small Cost into Efficient WEBSTER Systems

NOW is the time to act in order to derive full benefit and economy for adequately heating buildings next winter, without carrying several pounds back pressure on the engines or using an undue amount of live steam.

From present indications, there will be a great scarcity of coal during the coming cold months. Prepare NOW to overcome this by installing the WEBSTER System.

At comparatively small cost and without extensive alterations or seriously impairing the operation of any department—the unsatisfactory heating system can be changed over in a short time into the efficient

Webster

Vacuum System of Steam Heating

Over 11,000 successful installations in all classes of buildings during the past 30 years. A large part of these were changed over from old heating systems. A return of from 25 to 50 per cent has often been realized on the investment required for changing over a poorly designed heating system into the efficient WEBSTER System.

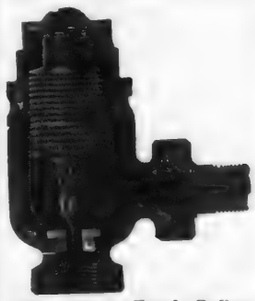
The WEBSTER System provides perfect circulation of exhaust steam, live steam or a combination of the two through every radiator or pipe coil without appreciable back pressure on the engine, or noise, odor, air binding and other objectionable features.

We co-operate with the architect, consulting engineer, heating contractor or owner to help secure the best and most economical results at the least possible cost.

The Webster Guarantee is the Owner's Insurance Policy

Write TODAY for a copy of our Catalog V-37
Heating the Manufacturing Plant by the Webster System

WARREN WEBSTER & COMPANY



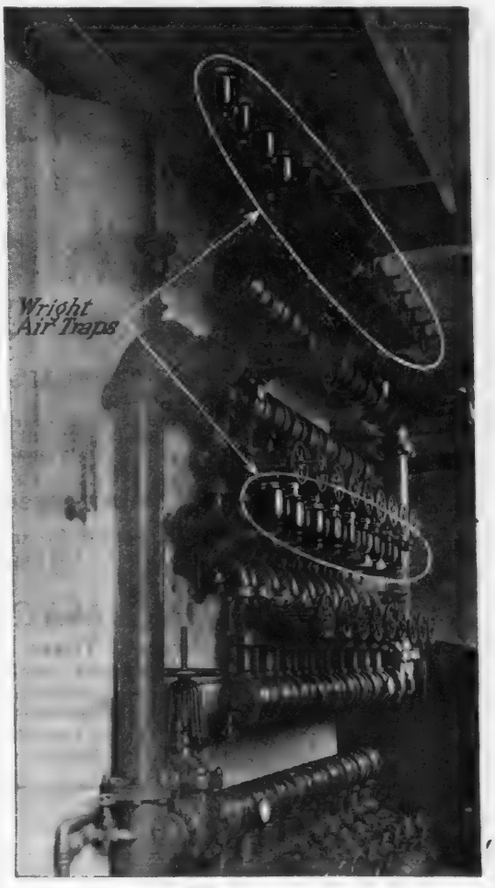
Webster Sylphon Trap for Radiator Returns and at Drip Points

MANUFACTURERS
Webster Systems of Steam Heating, Webster Feed Water Heaters, Webster-Lea Heater-Meters, Webster Steam and Oil Separators and Webster Steam Specialties

MAIN OFFICE AND WORKS
CAMDEN, N. J.

Branch Offices in 30 Cities

Fuel Conservation Specialists for Thirty Years



Wright Air Traps in the Plant of the Ford Motor Company, Detroit

Removes Air From Water Under Pressure

Designed for removing air from water under pressure, the Wright Air Trap has large capacity —is positive in action and simple in construction.

When used in hot water heating system, the trap is placed at the highest point. When placed in street manholes, the Wright air trap requires no attention whatever.

Other purposes of this trap are for removing the air from closed water receivers, sounding an alarm when the water in closed tanks reaches a lower point than is desired, and discharging air from closed water receivers.

Write for catalog describing the Wright Trap.

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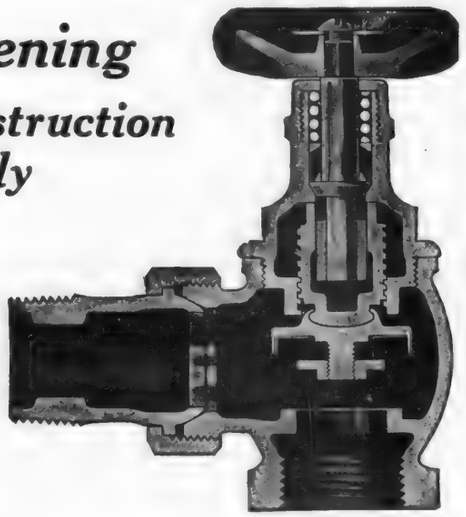

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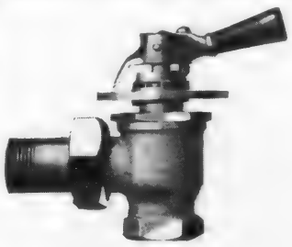

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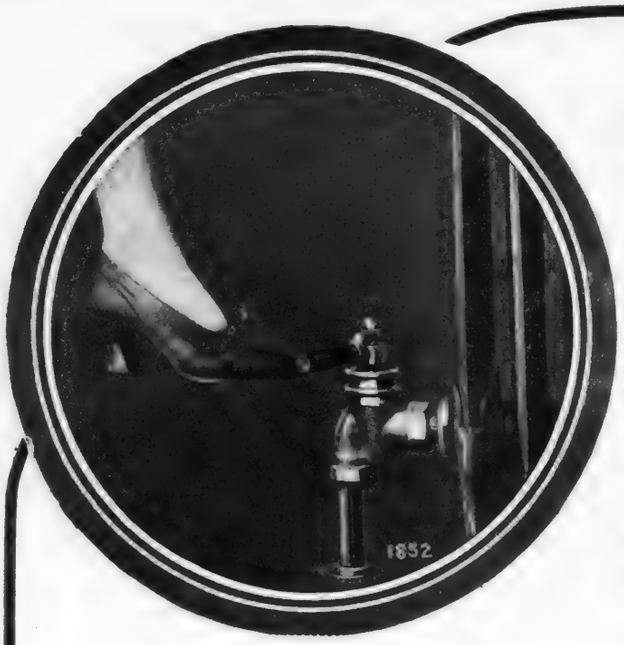

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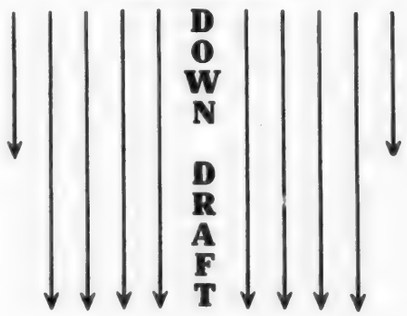

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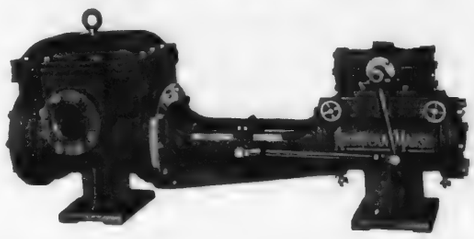

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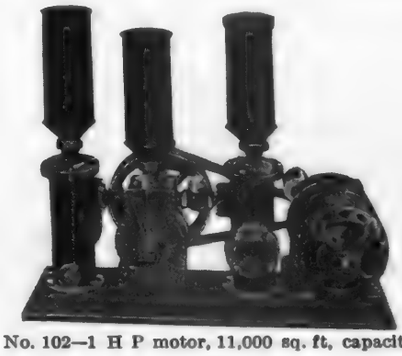

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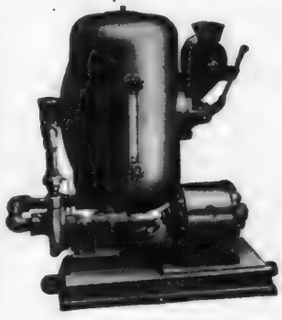

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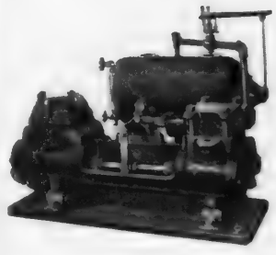

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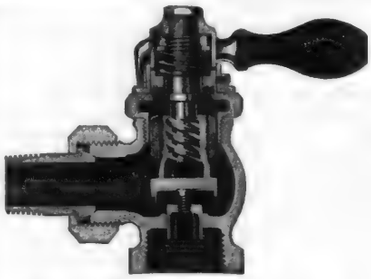

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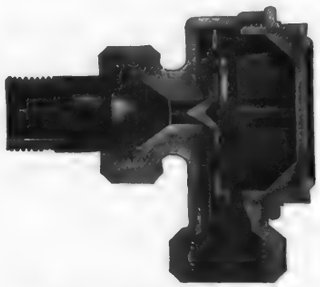

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The Heating and Ventilating Magazine

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JANUARY, 1920

INTERIOR PIPING ERRORS THAT HAVE CAUSED TROUBLE

With Notes on the Changes Made that Spelled the Difference Between Failure and Success.

By LLOYD HOWELL.

The thoughts hereafter set down are not intended as ill-natured criticisms, but are offered rather as practical suggestions to enable the engineer and contractor to avoid similar errors in their own practice. Thoughtlessness is mainly responsible for many curious and weird examples of the steam fitter's art which may be found in the piping systems in buildings in almost any of our cities.

At times it seems some "imp of perversity" has guided the fitter's hand. No doubt you have met the type so affected, his old reliable long-handled Stillson in hand, used alike with strength and determination on rough pipe or polished trimmings, while with brow burrowed in puzzled lines he studies a blueprint and then consults his wrench for inspiration. The problem solved to his entire satisfaction, he whistles a merry tune while selecting an imposing array of fittings and nipples, materials for his masterpiece.

Possibly the drawing before him was the work of a draftsman without even a speaking acquaintance with unions, ells or tees. It may be those were not pipes he marked on flat paper, but merely iron. But regardless of whether an 8-in. valve was shown in a space too small for a 6-in. size, or other manifestations of the draftsman's impatience at structural limitations, the fitter is expected to "get it in somehow and make it work."

As an engineer, have you ever failed to recognize the child of your design in the maturity of the fitter's interpretation? If a contractor, have you never been called from a warm bed on a winter's night to hear a plaintive voice on the telephone say, "We ain't had a bit of heat since your man fixed our boiler." If a heating superintendent for a central heating station, have you never heard the complaint, "That steam you are sending us is all wet. We can't get enough heat."

POOR STEAM FITTING THE MOST FREQUENT CAUSE OF TROUBLE.

Poor steam fitting causes more trouble and expense than bad design and frequently the idea farthest from the workmen's thoughts is the cost of operation for the plant he is constructing. Sometimes, too, he is not considerate of the time and materials cost of the work, which explains why many a contract taken on a basis of fair profit has actually netted a loss.

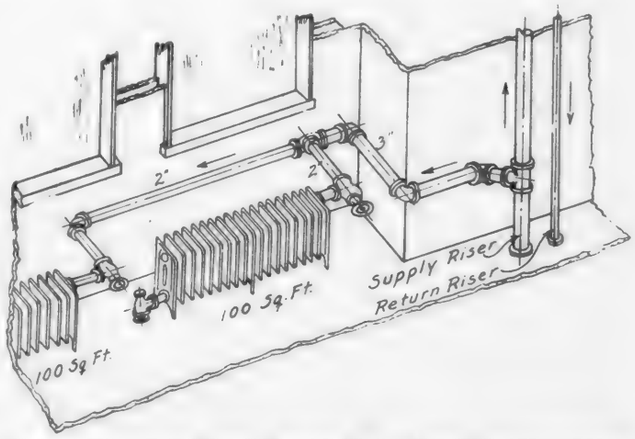


FIG. 1.—EXPOSED RISER MAINS AND LARGE RADIATOR CONNECTIONS IN HOTEL LOBBY.

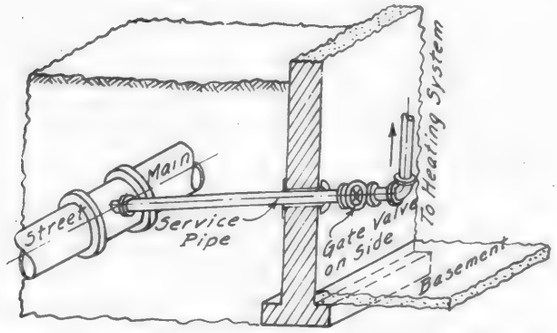


FIG 2.—SERVICE CONNECTION WITH DEFECTIVE GATE VALVE.

In checking over an installation it is frequently apparent that alterations in piping, or perhaps a complete remodeling of the system, which may be an old one and has served its time, are nevertheless justifiable from the standpoint of cheaper operation, paying a large rate of interest on the investment required for the change. In general, the methods using the simplest and fewest number of appliances deserve preference. These likewise require a smaller amount of materials and fittings and are easier to care for and to operate intelligently.

The ultimate object, of course, is that of satisfactory temperatures with the least expenditure of money and many a heating system is operated to-day as an economic failure, although not recognized as such by its owner, due to the fact that he is not well informed.

Fuel costs were never so high as at present. Investigation of conditions will generally disclose opportunities for small hourly savings which become startling amounts when one considers that the average heating season is some 5,000 to 6,000 hours in length.

The following illustrations show examples of incorrect work, each one being taken from an actual installation and found by inspection after the steam fitter's announcement of work completed had been received. They are quite typical of what we may expect where explicit directions are not given.

WATER HAMMER IN A HOTEL LOBBY RADIATOR.

Fig. 1 shows an arrangement of first-floor radiators on a two-pipe vacuum heating system in the lobby of a leading hotel. The main risers are exposed on the pilaster faces. These could have been partially concealed in the recess. The radiator connections are unnecessarily large and represent a waste of time and money. The 3-in. x 2-in. x 2-in. tee is non-eccentric, thus retarding drainage in the connection to the point of causing a small water-hammer at times. The radiator connections might better have been made from the basement below, with small supply stubs brought through the floor to each radiator.

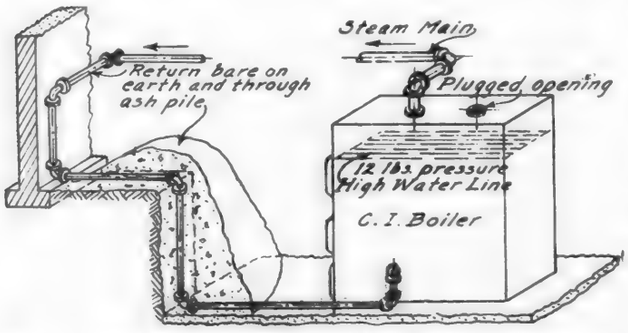


FIG 3.—A BOILER PRESSURE OF 12 LBS. GAUGE WAS NECESSARY TO OPERATE THIS SYSTEM WHICH CAUSED WATER TO LEAVE BOILER.

DEFECTIVE GATE VALVE IN SERVICE CONNECTION.

A service connection (Fig. 2) between a central heating plant and a store building had a defective gate valve which did not permit sufficient steam to pass. Much trouble, annoyance and dissatisfaction was caused before the difficulty was located and remedied. The total expense was entirely out of proportion and was quite an imposing sum. Had the valve been examined before connecting, its defect would easily have been seen, but when in place this was hard to detect.

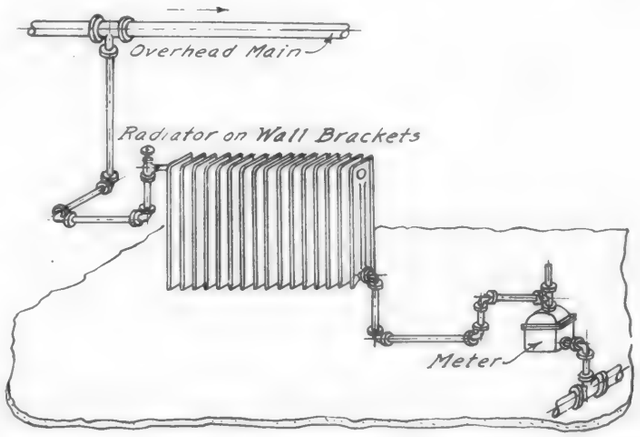


FIG. 4—A CONNECTION WHICH CAUSED FREEZING OF PIPES AND RADIATOR.

WHERE LOW COST AFFECTED EFFICIENCY.

Fig. 3 is a detail of an installation in a leading hotel in a moderate-sized ctiy. Low first cost was the primary consideration and the one-pipe steam system was selected for this reason, but it was of scant capacity. The basement had a very low head-room without floor, and an excavation was made for boiler and firing deck. A cast-iron sectional boiler, having a very high water-line, was installed without headers, and the bare return mains rested uncovered on the earth and were buried for 12 ft. in length in a pile of wet ashes near the boiler. Operation at 12 lbs. pressure was necessary for maximum steam delivery, but such operation generally caused all the water to leave the boiler. Fuel consumption was excessive and the return piping was destroyed in a comparatively short time by corrosion.

CONNECTIONS THAT CAUSED FROZEN PIPES AND RADIATORS.

A basement radiator connection on an Atmospheric system ,using steam from a central station, was made in a church (Fig. 4). During unheated periods the water which accumulated in both pipes and radiator was frozen in cold weather sufficiently to rupture pipe and castings. The supply pipe should have been taken from the top of the main and the radiator valve connected in a horizontal position, with the handle toward the room, so that draining of the connection would be assured. The return pipe, with the pocket shown, will not pass air from the radiator. This pipe should have been extended horizontally, with reasonable grade toward the meter and connected to a vented receiver from which the overflow delivery would pass to the meter.

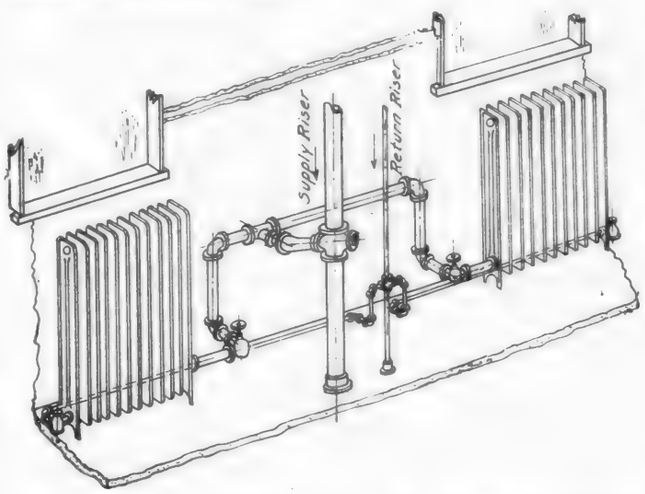


FIG. 5—A CASE OF EXCESSIVE HEATING CAUSED BY UNCOVERED RISERS.

WATER POCKETS IN RADIATOR CONNECTIONS.

The radiators shown in Fig. 5 were placed in an outer office of a suite in a tall and beautifully-finished office building, recently constructed in a State capital. Risers are 18 in. from the wall. No floor plates are used and the pipe sleeves extend 2 in. above the finished floor line. A cross in the main supply riser is fitted with a plug in one side and a 2-in. street ell in the other. Both corner valves on the radiators are connected so that water pockets 1 2/2-in. deep are made. Each return connection requires a 4-in. lift of the condensate.

No covering is used on the risers so that heat is delivered from a certain proportion of the surface during every hour steam is on the system, regardless of whether it is desired by the tenant or not. If the bare piping is excess surface, which assumption is generally conceded by heating engineers, a fair calculation for this case would be:

15 sq. ft $\times$ 0.12 lbs. average hourly condensation $=$ 1.8 lbs. $\times$ 5,000 hrs., or 9,000 lbs. per season, which, at a cost of 75 cents per 1,000 lbs., equals $6.75.

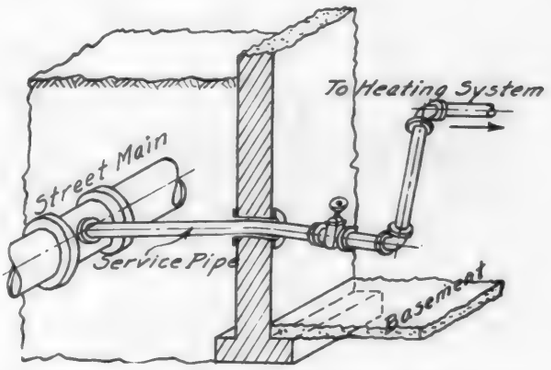


FIG. 6—EFFECT OF LACK OF PROPER SUPPORT FOR SERVICE PIPE.

Covering of fair quality will save three-quarters of this amount. The calculation will differ in degree, but not in kind, with various locations and buildings.

Incidentally it may be asked why manny heating engineers design for these high buildings systems using large vacuum pumps. Conditions are ideal for gravity return, while pump operation frequently is expensive. The steam circulation problem is easy, compared to that of almost any central heating plant, many of which use no vacuum pumps. Many times the fitter on vacuum connections disregards grade and pitch, for he says, "We're going to have a big vacuum pump to make it work anyway."

SERVICE PIPE WITHOUT PROPER SUPPORTS.

A service pipe correctly installed in a drug store was connected to the heating system without proper supports (Fig. 6). When steam was turned on the expansion caused a trapped service to the depth of 3-in. A drain, with steam trap, was later installed. This trap is of the continuous discharge type, as should be the case for such duty.

INVERTED VALVES ON BASEMENT RADIATORS.

A Y. M. C. A. building using individual boiler supply with an Atmospheric system, was found with

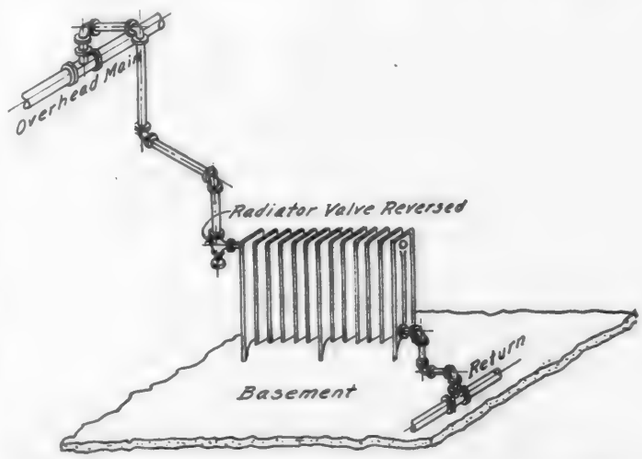


FIG. 7—EXAMPLE OF USE OF INVERTED VALVE ON BASEMENT RADIATOR.

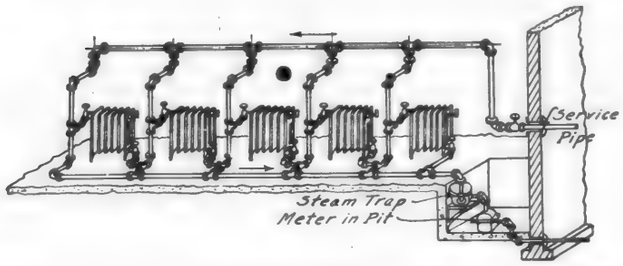


FIG. 8—RADIATOR CONNECTIONS THAT RESULTED IN SHORT CIRCUIT THROUGH FIRST TWO RADIATORS.

inverted valves on the basement radiators (Fig. 7). Dirt and scale and condensate had collected sufficiently to cause trouble. Had the piping been perfectly clean the water alone would have caused enough difficulty to call for condemnation of the connection. The valve, of course, should have been connected in a horizontal position. In this building the main returns extended to a closed receiver and no vent was provided on the system. A considerable portion of the heating surface was entirely air bound until a vent pipe was later installed.

SHORT CIRCUIT IN STEAM HEATING SYSTEM.

A steam pressure system in a candy store using central station supply was installed as shown, (Fig. 8),

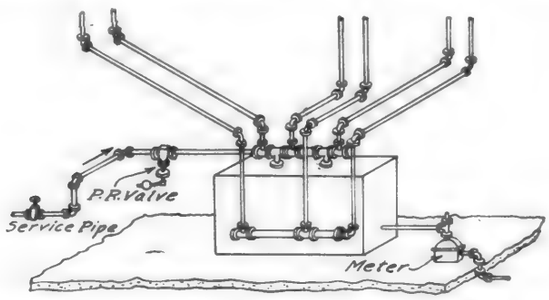


FIG 9.—WATER HEATING SYSTEM IMPROPERLY REMODELED FOR VAPOR.

with a small overhead steam supply main and a large return main below the floor. When steam was turned on at the esrvice pipe a "short circuit" was at once established through the first two radiators and it was almost impossible to heat the others at any time.

The remedy applied in this case was to entirely remodel the piping system, using proper capacities and corresponding piping, so connected that each radiator was supplied with steam. As a result air and water removal was accomplished without hindrance.

WATER HEATING SYSTEM IMPROPERLY REMODELED FOR VAPOR.

A café using a small water heating system attempted to remodel to an Atmospheric system, with central supply (Fig. 9). The inspector found that the radiator connections were unchanged except for the installation of a graduated valve on each radiator. The water had been drained from the system, the service pipe and pressure-reducing valve installed, delivering to the old water header on the boiler. A boiler drain was used for the inlet to the meter. Needless to say, it was never operated as such. When the service gate valve was opened, steam immediately passed through the boiler and issued from the meter vent, filling the basement of the building. For correction, the boiler was removed and proper steam and return mains installed, delivered to a vented receiver, with an overflow connection to the meter.

TROUBLE CAUSED BY IRREGULAR SERVICE PIPE.

A building owned by a fraternal organization had a standard one-pipe steam system of moderate size

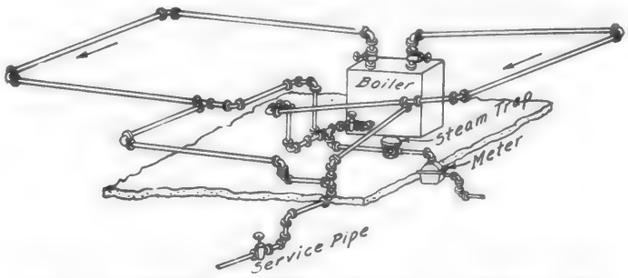


FIG. 10—TROUBLE CAUSED BY IRREGULAR SERVICE PIPE.

supplied from a low-pressure boiler. Being desirous of purchasing steam from a central plant and retaining the boiler in reserve, valves were placed on the supply and return connections at the boiler. The extremely-irregular service pipe pictured in Fig. 10 was installed, delivering steam to the branch supply mains in two locations and at the low points. Remarkably poor and inefficient service resulted until the supply pipe from the street main was straightened and extended to the high points of the system.

DISREGARDING HEATING EFFECT OF CONDENSATION.

The supply to a one-pipe steam heating system in a jewelry store was changed from individual boiler supply to central station service and the connections were found as shown in Fig. 11. The steam header on the boiler had been fitted with blank flanges on the connections to the steam space and a "balance pipe" with gate valve installed between header and return main, evidently with the thought that by partially

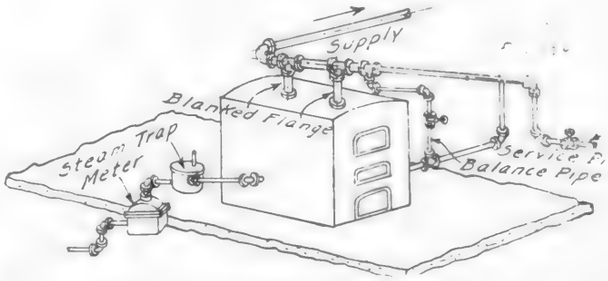


FIG. 11—HOW AN INDEPENDENT HEATING SYSTEM WAS INCORRECTLY ALTERED TO USE CENTRAL STATION SERVICE.

closing the valve a proper differential pressure might be secured between supply and return. No heat was required for the basement, but the temperatures there were found to be quite high, due to the large steam-filled boiler surfaces; the wastage of heat was excessive.

Later the boiler was entirely disconnected and economy radiation was installed to utilize the heat from the condensation, whereupon the bills for the steam service became normal.

This illustration shows an error frequently found in similar cases, that is, to entirely disregard the heating effect of the condensation. The neglect resulting from such errors has cost large sums of money. In other cases some economy surface has been used, but the amount is not enough to conserve more than a small part of the available heat. The reduction in operating cost due to the installation of proper economy radiation, well designed and proportioned, is regularly about 15%.

PLAN AND SPECIFICATION DATA SHEETS FOR HEATING AND VENTILATING

Forms Suitable for Use in Preliminary Work Prior to the Design of the Installation Itself.

The usefulness to the designing engineer of a plan and specification data sheet, with blanks to be filled in prior to making the layout, will be appreciated by all engaged in this kind of work. The particular form presented herewith was a matter of growth over a period of years, during which time its usefulness was proved as a decided advantage and a ready means of obtaining the desired information.

The form covers the general field of heating, ventilation, refrigeration and vacuum cleaning and includes additional memoranda relative to the building construction, electric and plumbing service. For specialized fields, the form can easily be altered to suit the requirements.

The use of this form enables the designer to take up with the architect at one time all questions without the omission of a single item, and also points out to the architect in ample time such matters as must be taken care of in his own design. All other information is supplied by the proper person of responsibility and the sheets are then placed on file where they are available both to the designer and specification writer, being indicative to each of what must be embodied in his own work. This method avoids the inefficient and careless way of scattering several data sheets about the drafting room in the hands of more than one draftsman and does away with the annoyance of having several persons ask the same question of the same party or the repetition of certain questions by those who forget. Such points as are frequently overlooked in the design are automatically taken care of by having this form as a standard and, above all, it is a time saver and an antidote for worry.

In practice, each undertaking, though following the same general engineering lines, has its own peculiarities, and each architect has his own way of handling the work, either as to the portions assigned to the engineer or the items divided among the various contractors. Again, his specifications may cover all or a part of the building and its appliances. The mechanical specifications may be made a part of the architect's specifications, either directly or by reference, or again, at least the general conditions may be fully covered by those of the architect.

At all events, it is important that the building construction be ascertained, in so far as it affects the work of the heating and ventilating engineer. Windows may be with single or double-glazed and with metal weather strips. Foundations, trenches, pits, manholes, drains, etc., for mechanical appliances are sometimes included in the heating and ventilation contract, but may be placed in the general or building contract. Tees in drain and water pipes must be left by the plumbing contractor for connection to mechanical apparatus. Likewise, the electrical contractor is required to bring his wires to a certain point. Thus, it will be seen that the form is a ready guide for work as carried out in practice.

At various points pertinent comments are made which are valuable since they indicate the design or limit it to one of the several methods so indicated. Precautionary notes are also given to avoid the usual errors. Such notes have developed from experience and it is interesting herein to briefly point out certain of these, grouping them for convenience. They are as follows:

PRECAUTIONARY NOTES TO AVOID ERRORS.

Arrange for chases and pockets for concealed pipes.

Show on plans for clearance ,all dampers and clean-out doors. See that smoke pipe does not interfere with boiler manhole, nozzles or drums, and that there is a space of 12 in. over the smoke pipe.

See that only the same pressures go to one steam trap.

See that radiators do not interfere with windows, shutters, doors, closets, passage-ways, blackboards.

Keep them below window sills.

Use wall radiators on stair landings when possible, and keep radiators out of line of travel.

See that lowest radiator is at least 18 in. above water line. (Indirect 24 in.)

See that all piping is at least 18 in. above water-line.

Look out for stairways, walls, landings, windows, doors, transoms, girders, etc., in running pipes.

Keep pipes out of vegetable and similar rooms.

Provide for expansion with offsets and swing joints.

Never use 1-in. pipe in supply on one-pipe work, or where water and steam run in opposite directions.

On pipe buried under floors show tile, covering and drawoff.

See that steam and return mains are valved alike, with check valve on returns.

Boilers of over 50 H. P. requiring mechanical means of feeding must be provided with duplicate apparatus.

See that run-outs can be run as shown. If over 5 ft. long make one size larger than radiator connection. Do not let risers or runouts run through cornices, coves or plasters.

Date———— Job No. ————

Plan and Specification Data Sheet

FOR THE HEATING AND VENTILATING SYSTEM.

For ————

————

Architects ————

Address ————

Plans and spec. to be ready ————

Date same ————

————

Job in general charge of ————

Date sheets compiled by ————

Draughtsman in charge of work ————

For special Boiler Plant information apply to ————

For special Piping System information apply to ————

For special Ventilating System information apply to ————

For special ————

apply to ————

Radiation figured by ————

Figures checked by ————

Work put on plans by ————

Plans checked by ————

————

IMPORTANT: No change in the plans of this work is to be made except by authority of the member of the firm is charge.

The plans must be carefully checked with this schedule before being issued. Every item called for herein not marked "x" must be shown on plans.

The draftsman will indicate on these sheets all special information and instructions required by the Specification Writer. Use back of sheets where necessary, with note on front calling attention thereto.

NOTICE: Place height of story, top to top, on each floor plan, including height of basement and attic and thickness of all floors and roof, unless riser sheet is made.

Place the title plate filled out in full on each sheet, in the lower right hand corner where possible.

Each plan must be signed and dated before being issued.

DETAILS OF PROPOSALS.

SPECIAL INSTRUCTIONS: No original drawing shall be sent from the office unaccompanied by a member thereof.

All plans or specifications sent from the office shall be first recorded with the executive clerk, or in his absence with the chief draftsman.

The taking of figures shall be in charge of of the executive clerk.

The list of bidders will be made up by the person in general charge of the job.

Give full list of bidders below, and fill in prices when received.

IS THE HEATING TO FORM

1. A separate contract? ————
2. Part of the builder's contract? ————
3. Is part of work to be done by the day?————
4. Is the contract to be subdivided? ————

If so, how? ————

————

————

LIST OF BIDDERS. *PRICES.*

PRELIMINARY DATA.

For General Conditions.

1 What is the legal name of owner? ————

————

2 Address proposals to ————

3 Send proposals to ————

4 Bids to close: Place ————

Date ————

5 Endorsement required ————

6 Withhold final payment for ————days.

7 Will the owner, general contractor or this contractor do the cutting and patching? ————

8 Will temporary heat be required? ————

If so, will temporary connections be paid for, or made at no extra charge? ————

Will owner or builder pay for connections?———

9 Who will furnish fuel and service for temporary heat? ————

10 Who will furnish fuel and service for testing? ————

11 When is work to be started? ————

12 When is work to be completed? ————

13 Who it to pay for fire insurance? ————

14 (For Massachusetts, State, county or municipal work.) Has the city or town accepted the act of the legislature relating to payment of material and sub-contractor's accounts as covever by Chapter 311, Acts of 1904, and amendments? ————

15 Is a certified check required?

(Usually 2 1/2%) ————

16 Is a bond required? (Usually 25%) ————

17 Shall our standard or a special form of proposal be used? ————

18 How are specifications to be written? _____

BUILDING CONSTRUCTION.

19 General Building Construction _____
20 Walls _____ Roof _____
Partitions _____
21 Single or double glazing _____
Storm Windows _____
22 Windows with metal window strips _____
23 Skylights, single or double _____
24 Who will build foundations for
(boilers _____)
(fans _____)
(engines _____)
(motors _____)
(heaters _____)
25 Who will brick in the boilers? _____
26 Who will build trenches, pits, manholes, drains, etc.? _____
27 (Inquire concerning plumbing regulations relating to B. O. tanks, dry wells and running traps.) _____
28 Chimney location _____
Size _____
Height _____
Style of top _____
Water available, how near? _____
29 Is mechanical draft apparatus required? _____
30 Shall heating contractor furnish a steel collar for chimney opening? _____
31 Who is to build ventilators, if any? _____
32 Will the builder provide curb for ventilators? _____
33 Who is to flash about ventilators? _____
34 Shall exposed galvanized iron work be painted? _____
35 Are toilets to be vented through fixtures or registers? _____

PLANT DESIGN.

36 Is heating to be by steam or water? _____
37 From a central plant or boilers in the building? _____
38 Where direct and where indirect? _____
39 Gravity or fan system? _____
40 _____

BOILERS.

41 Kind of Boilers? _____
42 Stationary, shaking or rocking grates? _____
43 Shall smoke consumers be used? _____
44 Name for boiler fronts? _____
45 Summer heater for acc. coils or hot water service? _____
46 Is summer heater to be cross-connected to main boilers? _____
47 Kind of fuel to be used? _____
48 _____

BOILER PLANT EQUIPMENT.

49 Are coal scales desired? _____
50 Is a coal car or coal barrow to be furnished? _____
51 Are water service filters required? _____
Capacity? _____
52 Who furnishes the hot water tank? _____
53 Is thermostat required? _____
Who installs it? _____
54 Who makes steam connections to tank? _____
55 Is ejector or drainer required? _____
Installed by? _____
56 Who provides water and waste tees for its connection? _____
57 _____

RADIATION.

58 Style of radiation (Direct _____)
(Indirect _____)
(Direct-indirect _____:)
(Divided _____) (Wall _____
59 Are wall or ceiling coils required? _____
60 Location of cold air boxes for direct-indirect radiation _____
61 How shall radiators be finished? _____
62 Shall air valves be with or without drip pipes? _____
62a Return line pump? _____
63 (Arrange for exact location of all radiators, also acc. coils if used) _____
64 _____

PIPING.

65 Who is to furnish and set tees in cold water mains and in sewer for blow-off connections? _____
66 Where will same be located? _____
67 Shall risers be exposed or concealed? _____
68 Place runouts below ceilings, in or above floors? _____
Arrange for chases and pockets for concealed pipes, etc. _____
69 Shall separate auxiliary mains be installed? _____
70 Are steam or water connections to be made to other apparatus, and where? _____
71 _____

AUTOMATIC CONTROL.

72 Is automatic temperature regulation to be installed?. _____
73 _____

PIPE COVERING.

74 Quality of pipe covering? _____
75 Shall risers be covered? _____
76 Where to use extra sewed canvas jacket? _____
77 Paint pipe covering where and how? _____
78 Is a non-conducting ceiling required, and where? _____

ELECTRICITY.

79 Who will furnish electric current? _____
80 Nature? _____
81 Who will do wiring from and to where? _____

REGISTERS AND GRILLES.

82 Where shall registers or grilles be used? _____
83 Material, design and finish _____
84 Who will furnish grounds? _____
85 Who shall furnish grilles at outside air openings? _____

AIR WASHERS OR FILTERS.

86. Is air washer or filter desired? _____

CLEANING SYSTEM.

87 Is a vacuum cleaning system to be installed? _____
(Arrange for location of machine and risers.)

Additional sheets will be presented next month covering chimneys, draft apparatus, economizers, boilers, boiler trimmings, boiler settings, smoke connections, etc.

STANDARDIZED CENTRAL HEATING AND LIGHTING PLANTS FOR STATE INSTITUTIONS

Details of the New Policy Adopted for New York State that Has Reduced Cost of Plans and Increased Efficiency of Installations.

By G. B. NICHOLS.

Chief Engineer, State Architect's Office, Albany, N. Y.

With the rapid growth in population of the various State institutions throughout the country, the problem of remodeling and rebuilding institutional central heating and lighting plants, and the establishments of new institutions with their central plants, has become very acute in State government. Insane and feeble-minded institutions in general are now being planned for at least 2500 inmates in all States outside of New York State, and New York has been forced to accept a broader policy of designing for at least 3,000 inmates; in three existing insane hospitals, the population has increased to approximately 6,000 inmates. It is safe to say that two of these institutions will, within the next ten years have a population of 10,000.

Although the medical profession has been somewhat loath to approve an institution of this size, nevertheless conditions are such around large cities, like New York, that such a population must be considered. An institution of this size will occupy at least an area of two miles long by one mile wide.

To properly furnish heat and light economically for an institution of the size mentioned necessitates the establishment of a central heating and lighting plant, the location of which should be established as close to the center of the group of buildings as possible, so as to reduce the length of distributing mains and so that coal can be deilvered directly to the power house. For an institution with a population of 5,000 the necessary boiler horse-power to install in the boiler room would be 3,000 H. P., and there should be reserved space for the future growth of at least 1,800 H. P. The total requirements, therefore, would be 4800 H. P.

A STANDARDIZED BOILER ROOM.

The standardized boiler room, as adopted by the State of New York, is one consisting of eight 600 H. P. water-tube boilers, four being located on each side of a center aisle, the outside dimensions of the building being 80 ft. by 120 ft. If a smaller institution is under consideration, the design can be changed by installing eight 500 H. P. boilers, keeping the floor plan the same and simply reducing the height of the boiler room. Such a boiler house would be suitable for an institution whose final population would be 5,000. If a still smaller unit is desired, the floor plan can be kept the same, with the exception that the building will be reduced in length by one pair of boilers, or 23 ft. 4 in., making the total boiler horsepower 3,000 H. P., which will provide for a population of 4,000.

By again keeping the floor plan the same and reducing the size of the boilers each to 400 H. P., the total would then be 2,400 H. P., which plant would admirably serve an institution with an ultimate population of 3,000. This design is the minimum which should be considered by a large State, particularly one similar to New York, with such a large foreign population and congested city centers, harboring insanity in all its forms. It is therefore self-evident that the floor plan of the main unit, namely, the boiler room can be standardized in its construction for any size required by an institution.

FIG. 1—GENERAL ARRANGEMENT OF POWER PLANT PROPOSED AS A STANDARD FOR PUBLIC INSTITUTIONS.

THE NEW POLICY THE RESULT OF PAST FAILURES.

In the past, on institutional work, it seems to have been the general practice, both in New York and elsewhere, when there was a demand made by the institution for a central heating and lighting plant, for the engineer to draw up a complete new design, trying to

adapt same to all of the various requirements of the medical staff. This has led to many failures in that the design might have merits in all points, except a few minor ones which might so affect the operation of the plant as to completely condemn the whole design.

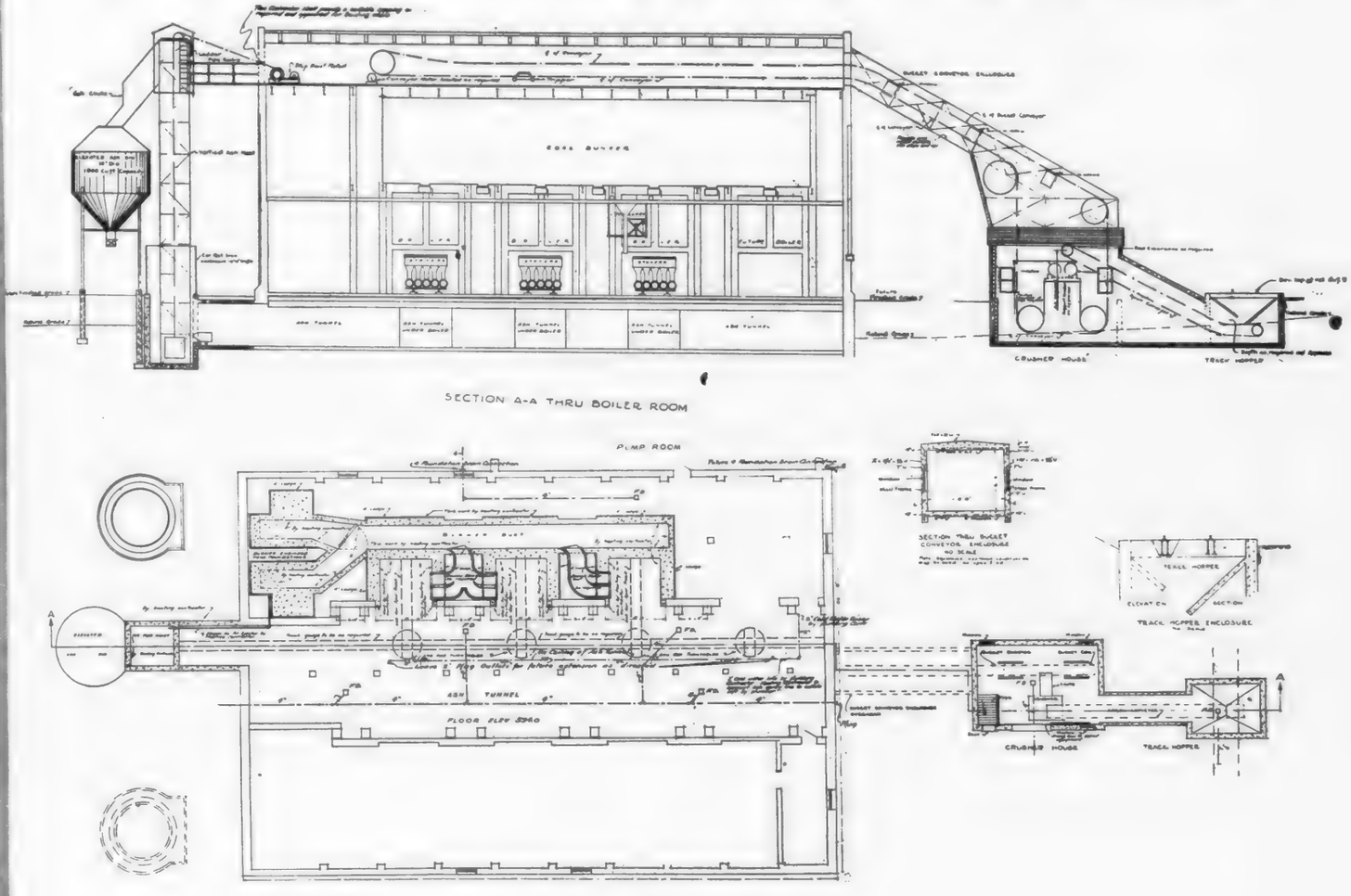
After experiments with several of these unfortunate mistakes, the State of New York has adopted a policy that all new designs for power plants shall be based upon a design already established, simply improving on such design and, so far as possible, keeping all plants similar.

By this method time has been gained in preparing the plans, the cost of plans has been reduced, the contracted material has been improved, and the efficiencies of the plants have been greatly increased after same have been placed in operation.

Now that the State has a number of plants, all of similar design, it will be possible in the future to transfer engineers from plant to plant without going through the expensive operation of breaking in a new engineer for a new design. It is also hoped that in the future the purchase of material for these similar designs can be centralized in one department, thereby making it unnecessary to carry duplicate repair parts at all institutions. It is also possible to more advantageously compare the operating conditions of such standardized plants.

OVERHEAD COAL BUNKERS.

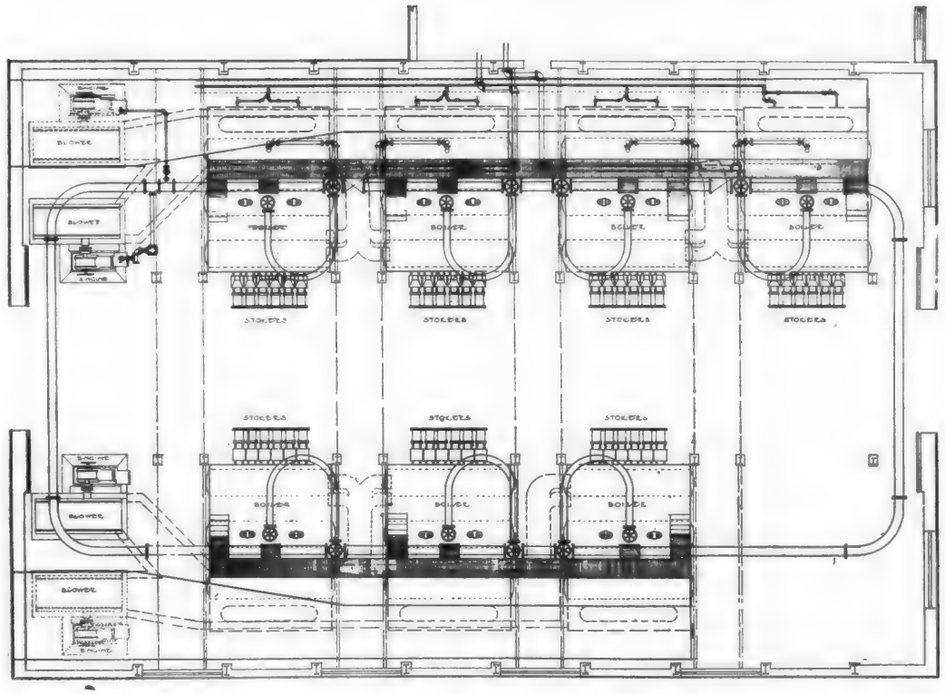
Boiler rooms to meet the above-mentioned requirements should be designed with an overhead coal bunker suspended through the center aisle, with a capacity of approximately 150 tons per pair of boilers, with eight as the maximum number of boilers. The total bunker capacity would be 600 tons, making approximately six days' storage. Two types of bunker are available, namely, a plate-steel constructed bunker, parabolic in shape, in general concrete, lined, or a patented bunker composed of steel strap reinforcement, lined with reinforced concrete, similar to that manufactured by the Brown Bunker Company which can be built by any contractor. The State has made it a practice to specify both styles of bunkers, thereby obtaining the advantage of competition.



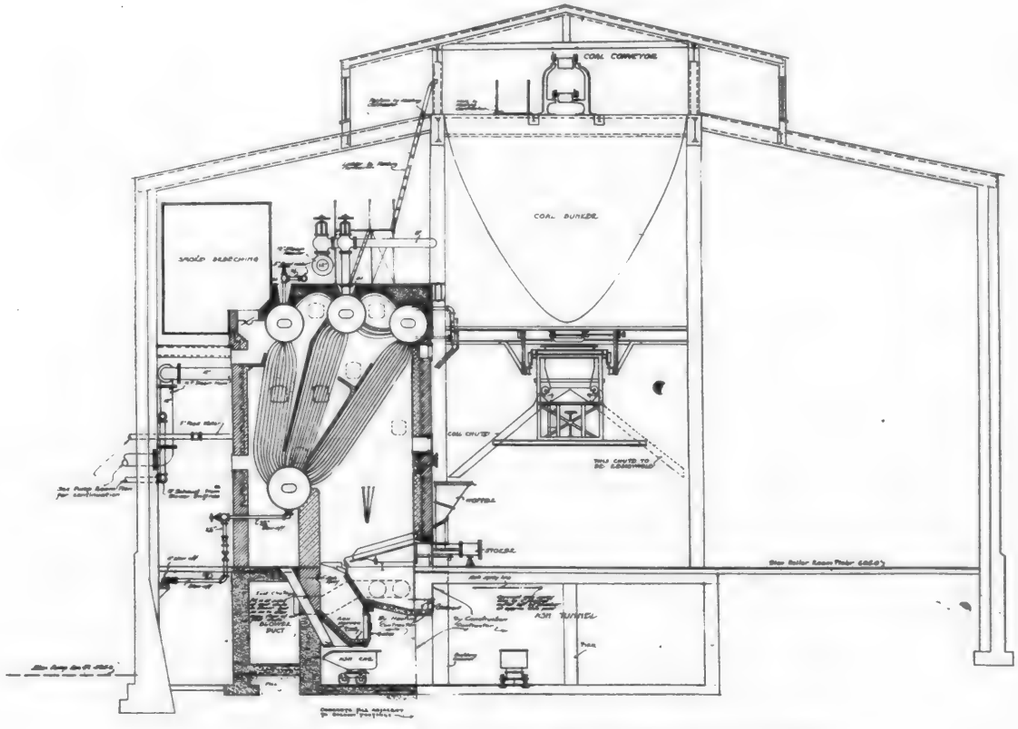
BASEMENT PLAN OF BOILER ROOM AND SECTION A-A, MARCY STATE HOSPITAL.

METHOD OF DELIVERING COAL.

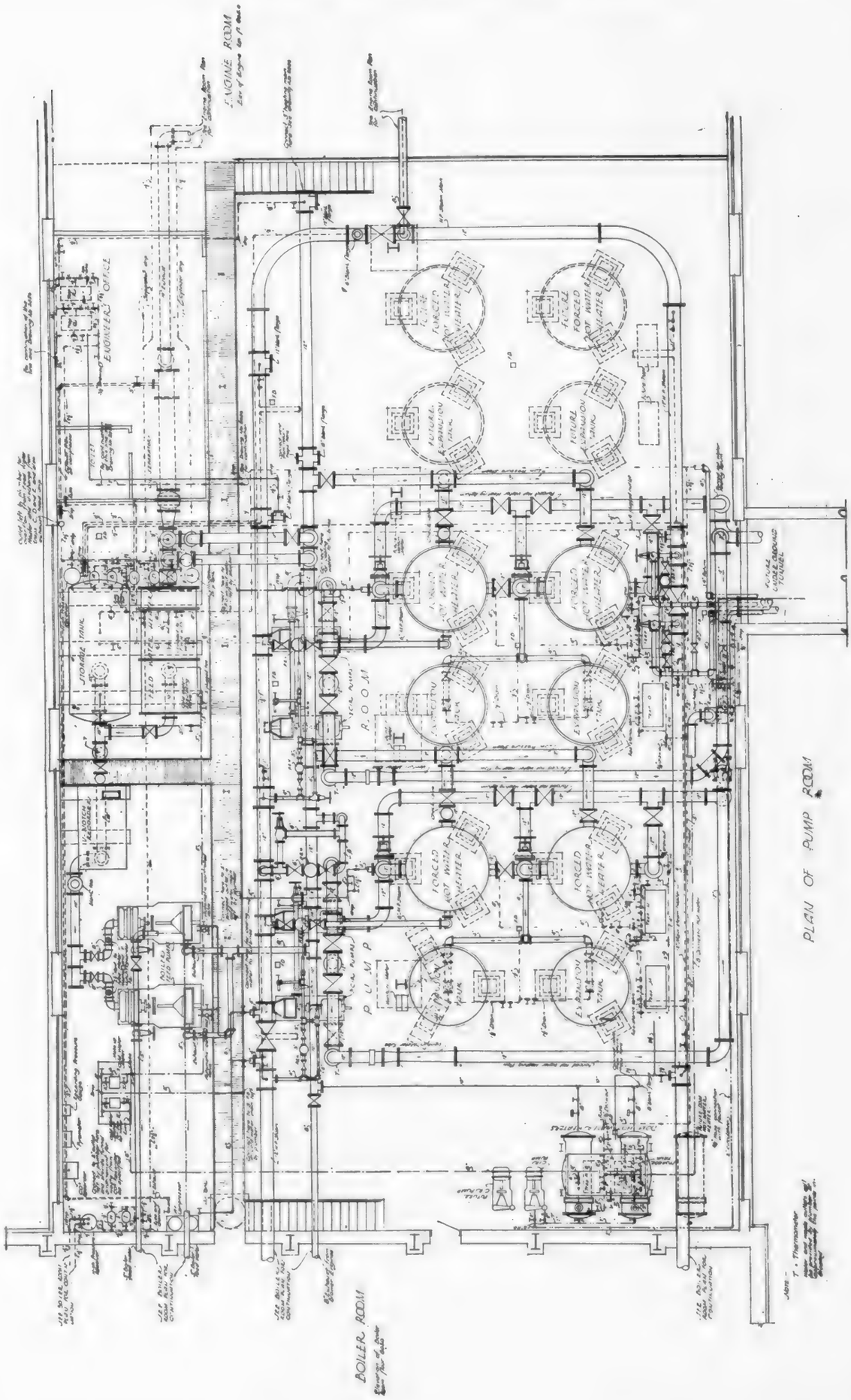
The coal should be delivered directly from the railroad track at grade to a track hopper from which track hopper the coal will be transferred by an en-



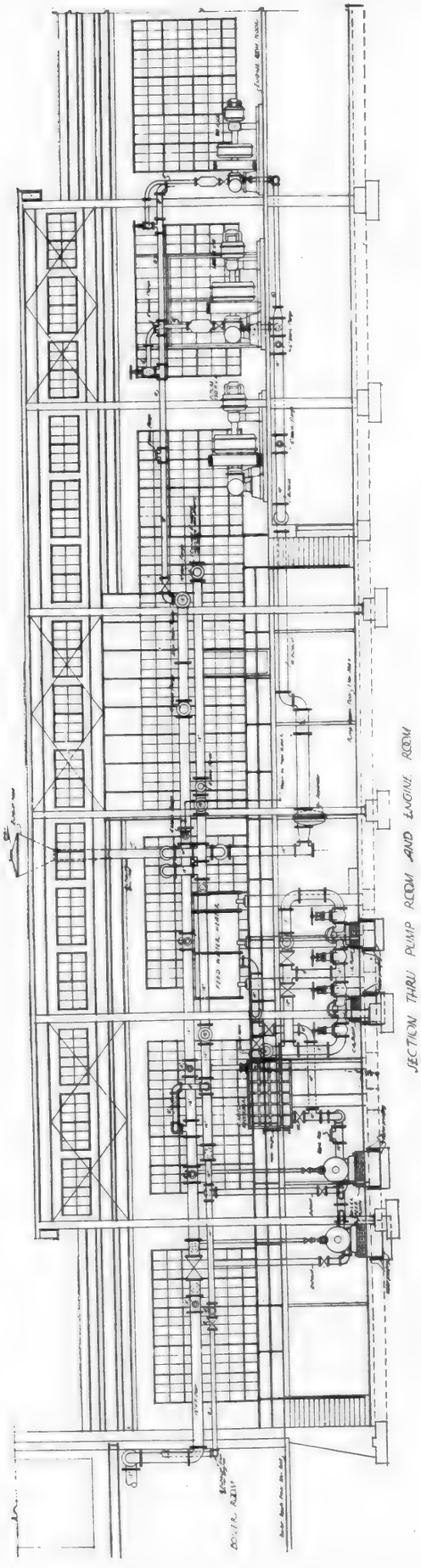
PLAN OF BOILER ROOM, MARCY STATE HOSPITAL.



SECTION THROUGH BOILER ROOM, MARCY STATE HOSPITAL.



PLAN OF PUMP ROOM, MARCY STATE HOSPITAL.



SECTION THROUGH PUMP ROOM AND ENGINE ROOM, MARCY STATE HOSPITAL.

closed apron-feeder conveyor to the crusher house in which is located the coal crusher. This crusher house is a simple one-story concrete structure under which passes the main coal conveyor.

From the crusher the coal is delivered to a bucket conveyor rising vertically approximately 58 ft. away from the power house to a point above the crusher house, thence on a diagonal to the after part of the power house. The conveyor then runs horizontally into the power house and across the top of the coal bunker.

Two types of coal conveyor are purchasable; the plate-steel bucket type, or the malleable iron bucket type, the latter being more expensive. In general it is believed that the malleable iron bucket has so much longer life that the extra expenditure is warranted in a permanently-designed power house, such as that for an institution, in which the machinery installed should always be designed to give the longest possible service.

IMPORTANCE OF ELECTRICALLY-PROPELLED WEIGHING LORRY.

From the bottom of the bunker coal should be delivered from the various gates to an electrically-propelled weighing lorry or crane on which the operator should ride in a suitably-designed cab. It has been found that the duties which this man can perform, namely, feeding the coal to the stoker hoppers and watching the water glasses on the various boilers, being in line with same, and keeping a general observation of the boiler room, due to his elevated position over the entire firing space, justify the expenditure for his salary and is a practice more than warranted. This man can also keep certain records around the boiler room without leaving his cab.

From the lorry the coal is delivered by chutes to the various stoker hoppers; it is hardly necessary to say that a plant of this size would be designed with stokers.

SELECTION OF STOKERS

In the selection of stokers for such a plant it appears that within the last three years the various manufacturers' engineers have come to a mutual understanding regarding the basic principles of a stoker to successfully burn soft coal without smoke, and be capable of overloads. The forced-draft underfeed type of stoker has been adopted by the majority of the leading manufacturers.

In the selection, however, there are two types of stokers still to be considered in the above plant. The first type is that delivering coal along the entire front of the boilers, with a grate pitching towards the bridge wall. This type is represented by the Taylor, Jones A. C., Riley and Westinghouse stokers. They should, in general, be used with a basement underneath the boiler room to which the ash can be delivered directly into ash cans.

The second type of stoker is that delivering the

coal through a center hopper, the grates pitching from the center retort towards the outside wall, with ash-dump plates on either side of the boiler and ash-pits underneath. This type is represented by the combustion type E heavy-duty Roach and new Detroit stokers. Boilers thus equipped can be used with a basement, or it is possible to install same and remove the ash directly on the boiler-room floor. Such an arrangement, however, is not ideal, as the ash-pit floors of necessity will have to be somewhat below the boiler-room floor levels, thereby making it necessary to raise the ash by shoveling from the pit to the boiler-room level. It also has the disadvantage of the dirt due to the ash being pulled on the boiler-room floor level.

ARRANGEMENT OF FORCED-DRAFT BLOWERS.

The blowers can be located directly at the end of the boiler room and, in general, are installed in duplicate for each battery of bailers. Four blowers, with their direct-connected engines, are installed for the entire boiler plant. Each battery of boilers will be connected to a separate chimney, thereby making it possible during the summer time to reduce the entire operating units one-half, simply operating one bank of boilers with its own blowers, breeching and chimney. This reduces the heat losses to a minimum.

DEVELOPMENT OF DESIGNS FOR ASH REMOVAL.

Considerable discussion has arisen regarding the removal of ashes from the under side of the boilers. In the first designs built, a central tunnel, with branch tunnels, was all that was installed. The boiler-room level was approximately 1 ft. above the surrounding ground level and a central tunnel ran along underneath the center aisle between the batteries of boilers, with branch tunnels leading under each boiler.

This tunnel construction now, however, has been abandoned and it is thought wise to excavate for a basement underneath the entire boiler room with a head-room of approximately 10 ft. The floor of this basement is approximately 3 ft. below the ground level, so that the building footings are just below frost level.

In this way the amount of excavation is kept at a minimum and the surplus earth removed is sufficient to provide ramps at either end of the building, making it possible to drive into the boiler room if, for any reason, it is necessary to deliver coal from trucks directly to the boilers, due to any breakage of the coal-conveying apparatus. Also by elevating the boiler room and having doors at either end, it makes the boiler room very airy and light during the hot weather.

The ashes, having been dumped to the ash-pit underneath the boilers, are then delivered directly to hand-propelled coal cars of approximately 3/4-ton capacity each. These coal cars run on branch tracks underneath the boilers to a central track in the basement between the boilers, thence along a main track through an outside tunnel. There they are dumped into a skip hoist elevator with vertical tower. The motor for operating the skip hoist is located in the upper part of the power house with a platform leading from the upper part of the power house to the tower. From the skip hoist the ash is delivered to an elevated steel ash-bin, concrete lined, of approximately 1,500 cu. ft. capacity, from which the ash can be dumped directly to motor ash trucks carried over platform scales and weighed and there recorded daily.

TRESTLES FOR COAL DELIVERY ABANDONED.

Another matter that has caused considerable discussion is the advisability of installing trestles for the delivery of the coal directly to the coal storage yard, as it is necessary at the various institutions to carry at least one year's supply in the fall. On account of the cost of the trestle and the amount of labor required to move the coal from the coal pile to the conveyor hopper, it has been decided that it is more economical to install the railroad track on the ground level, depending upon a crane locomotive to remove the coal from the cars. The coal is stored on either side of the storage tracks leading to the institution and, in turn, is moved by the crane from the coal pile up to the track hopper.

STANDARD BOILER ROOM DESIGN PROVIDES FOR FUTURE ADDITIONS.

The standard design here described provides for utilizing the space for future boilers, before the institution has reached its maximum capacity, by locating in such space shops and toilet and locker room facilities. Later on, when the additional boilers are added, these shops will be abandoned and such work will be carried on in an extension to the power house, hereinafter mentioned. At that time the toilets also will be removed and a small extension built on the outside of the building to accommodate them.

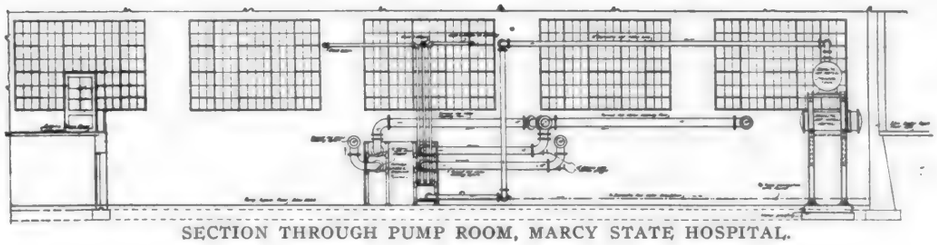
ARRANGEMENT OF POWER HOUSE.

Leading from the boiler room are the following rooms:

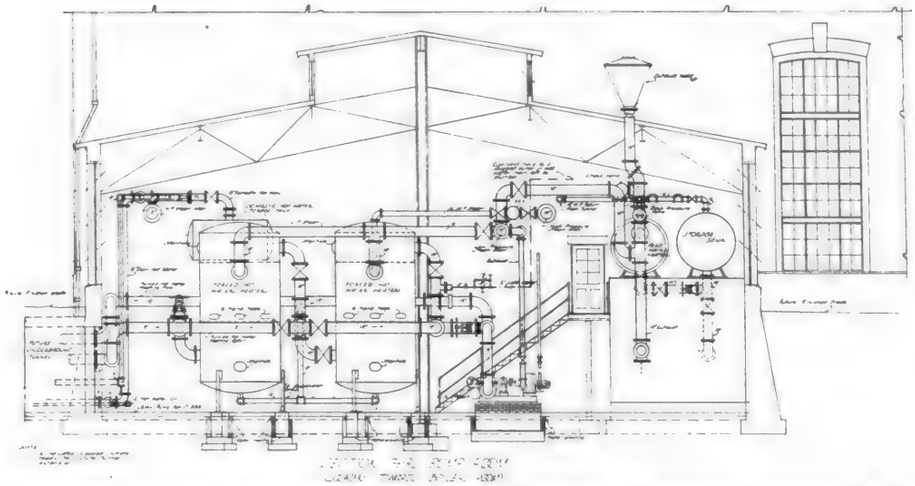
Pump room, with adjoining assistant engineer's office, the assistant engineer being in charge of the watch.

Engine room, in which are located the electric light plant, the refrigerating plant and the central fire-alarm plant. At the end of the engine room is a fireproof wall separating the pump room and engine room from the adjoining shop.

By referring to the accompanying illustrations it will be noted that, upon leaving the boiler-room one enters the pump room on a gallery; which gallery runs through the entire length of the pump room. The pump-room floor is on a level with the ash basement, thereby making it possible to enter directly the under-



SECTION THROUGH PUMP ROOM, MARCY STATE HOSPITAL.



SECTION THROUGH PUMP ROOM, MARCY STATE HOSPITAL, LOOKING TOWARDS BOILER ROOM

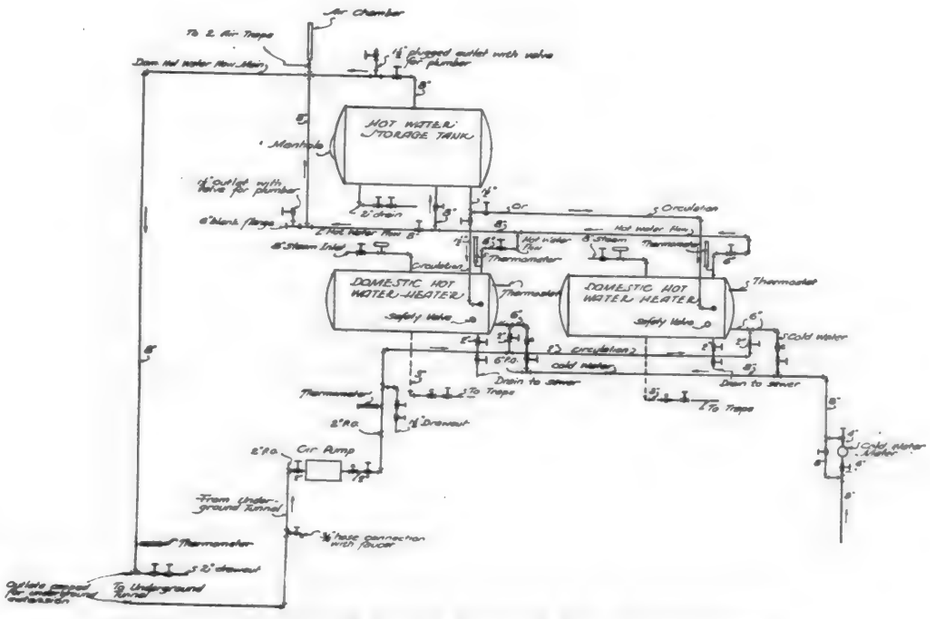
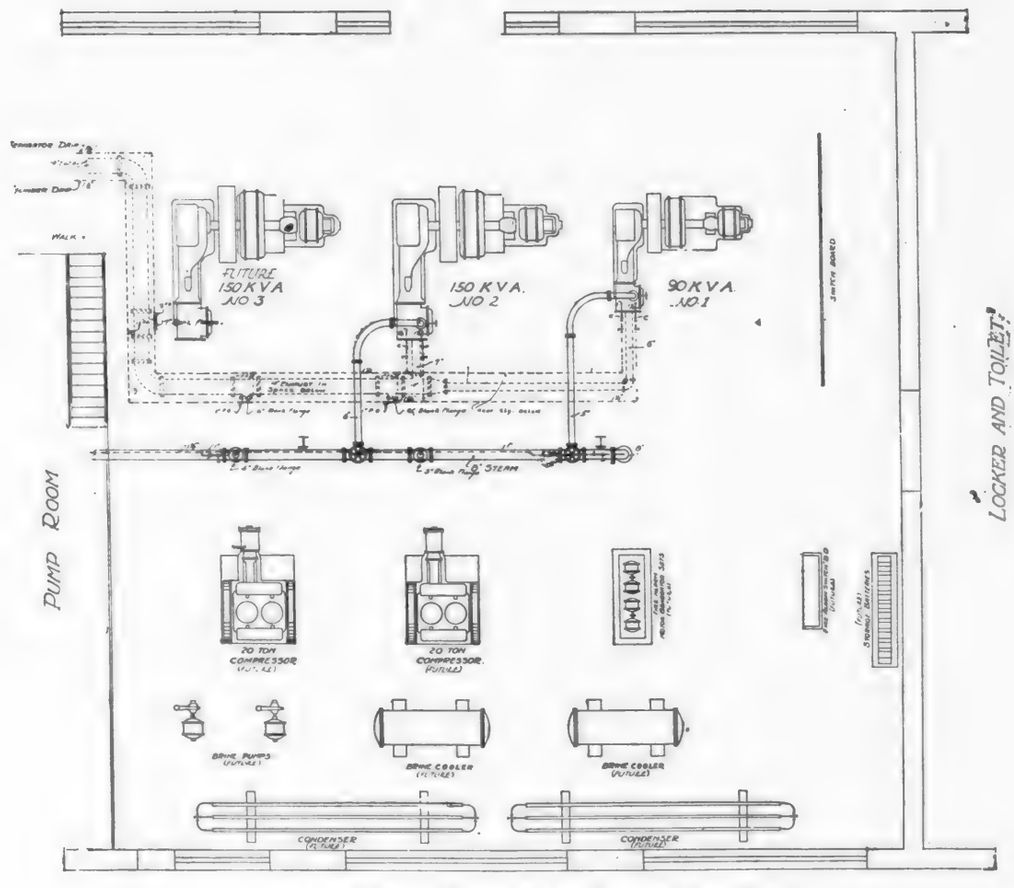


DIAGRAM OF DOMESTIC WATER HEATERS AND CONNECTIONS.



PLAN OF ENGINE ROOM, MARCY STATE HOSPITAL.

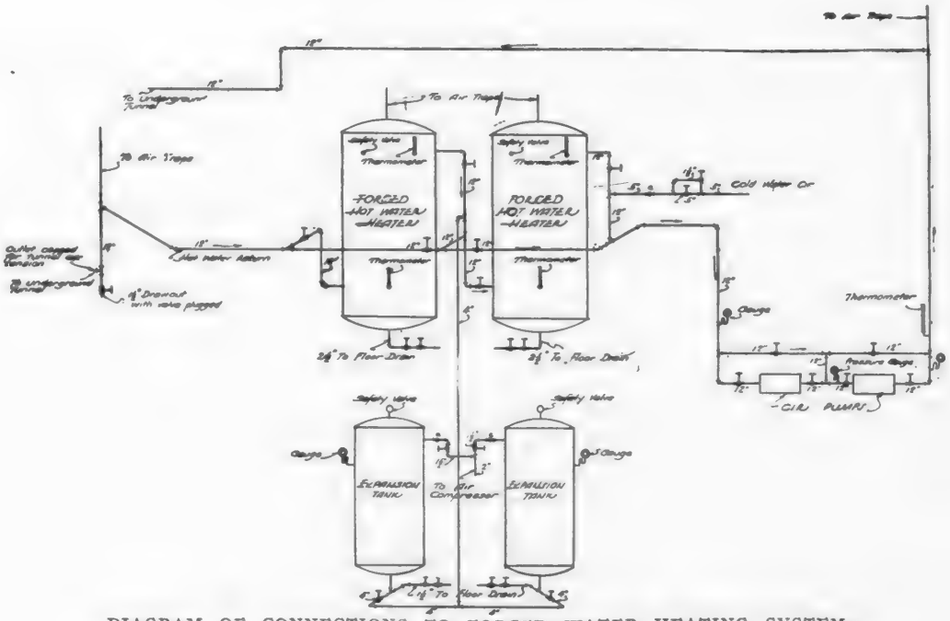


DIAGRAM OF CONNECTIONS TO FORCED WATER HEATING SYSTEM.

ground tunnels leading to the building and basement of boiler room.

From the gallery it is possible to observe the operation of machinery in the pump room and also from the assistant engineer's office which is provided with glass-enclosed partitions. The gallery leads directly to the engine-room floor level under which is a basement in which are run the various exhaust mains and electric feeders.

At the end of the building is the shop, in which will be located all of the various mechanics, such as tinsmiths, blacksmiths, plumbers, steam fitters and electrical workers for the upkeep of the institution. This force will be under the direct control of the chief engineer or superintendent of buildings and grounds, whose office will be located at the entrance to the shop. This portion of the building will also be furnished with a basement in which all supplies will be kept and where will be located also some of the heavy pipe-cutting machines. The shop is designed with large door openings and, until the institution has reached its growth, part of the shop will be used as a store house and as a storage for auto trucks and farming implements.

POWER HOUSE SHOULD BE BUILT IN ITS ENTIRETY.

It is, therefore, self-evident that the power house at a new institution should be built in its entirety in the beginning, as the spaces can be admirably used with a small population. This makes it possible to put off building of wagon and implement shed, store house, and garage until the power house and mechanics operations have reached such a point as to crowd these other activities into separate buildings.

DETAILS OF PUMP ROOM.

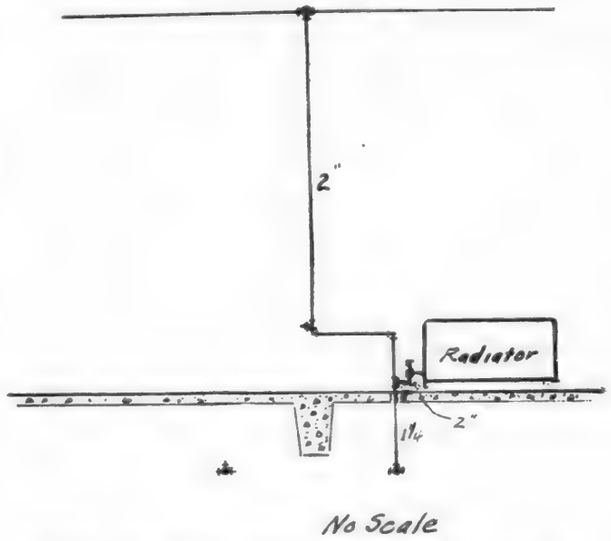
In the pump room are located all of the various pumps, traps, feed-water heaters and metering devices applicable to the system of heating selected. The width of this room has been standardized at 67 ft., being the same for either forced water, gravity or vacuum steam heating. The length varies with the system selected, the longest room being that for the forced water heating system, on account of the number of water heaters and storage tanks required for this system.

It is not the purpose of this article to discuss the merits of the various heating systems, such as gravity or vacuum steam, or forced water, as each system can be adapted admirably to heat an institution. The type to be selected depends upon the problem being considered, such as arrangement of buildings, and whether the plant is to heat existing or new buildings.

CONDITIONS FAVORING FORCED WATER HEATING.

If, however, it is a new institution under consideration, with buildings of fair size and such as require a minimum amount of ventilation, with most of the heating being done by direct radiators, and the distance between buildings being not excessive, there is no question, when final costs are considered, such as first cost, upkeep, operating conditions and annual coal consumption, that a forced water heating system should be selected. But each case should be well balanced and considered from all sides before final selection is made.

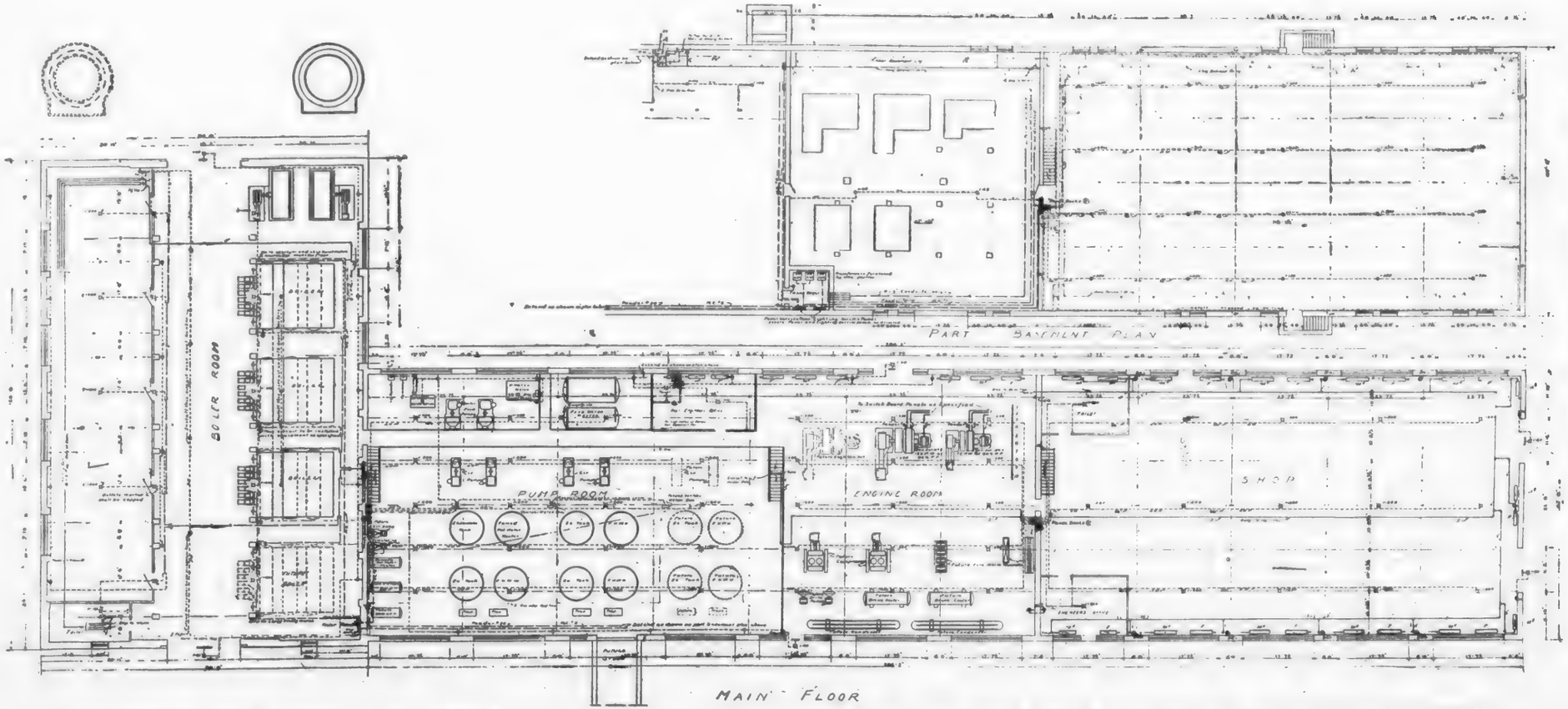
Buildings such as laundries, store houses and shops, however, are more advantageously heated by steam. It is also necessary to furnish high-pressure steam for laundry and kitchen purposes which should be supplied through separate high pressure mains.



DETAIL OF CONNECTIONS TO RADIATORS IN SHOP.

In general all of the domestic hot water should be furnished from heaters in the power house, making it possible to utilize a greater portion of the exhaust steam from the engines in the summer time for this class of service in the summer time.

The above policy led to the design of a new central heating and lighting plant recently contracted for by the State of New York and designed by the Department of Architecture, under the direct control of Lewis F. Pilcher, State architect, and G. B. Nichols, chief engineer, at the Utica State Hospital, Marcy Division, Utica, N. Y. This plant will finally have a capacity of eight 500 H. P. boilers, making a total of 4,000 H. P., with an electric plant consisting of two 150 K. V. A. and 90 K. V. A. direct-connected engine generators, the generators being 3-phase, 2,300-volt, 60-cycle alternators. The refrigerating plant will consist of two 20-ton capacity compressors, the ice-making plant being located in an adjoining storehouse in which will be located the refrigerating boxes. It is to be hoped that this design, so carefully worked out by the State of New York, which has already built two similar plants, will serve as a basis for central heating and lighting plants for other State institutions in the country as it is known that the overall efficiency of such a plant is far ahead of any other plant thus far reported upon or investigated at any other State institution.



ENGINEERING WORK IN POWER PLANT OF MARCY STATE HOSPITAL, INCLUDING BOILER ROOM, PUMP ROOM, ENGINE ROOM AND SHOP, SHOWING HEATING PIPING.

CONSIDERATIONS IN STEAM HEATING MAIN DESIGN

By F. A. Tucker.

Heating Engineer, Dansville (Ill.) Street Railway and Light Company.

The central station heating industry, in plants of average size at least, has seen its greatest development in connection with the utilization of exhaust steam from the generation of electricity. The general method of procedure in a steam heating system was to acquire enough heating business to use as much of the steam as possible, and to design a system of mains to distribute it at a pressure low enough to prevent any serious reduction in plant capacity. The relation between electric load and heating load, as well as the connection between type of electric generating apparatus and main design, were recognized from the beginning. The heating business has grown and new types of electric generators have been developed, so that the problem of steam main design today may be a rather complicated business requiring the consideration of many factors.

PROBLEM STARTS AT STATION END.

The details of main design have been often discussed and it is not proposed to enter into them here. The intention is to show that in a combination electric and heating plant, before an intelligent design of steam mains can be made, the engineer must investigate and consider not only the present and prospective heating business, but also the present and prospective electric business, the present electric generating equipment, its length of life and the type of apparatus which will replace it. The problem must be attacked from the station end first.

In the plant of average size, where the electric load has not far outgrown the heating load or vice-versa, the question, in the first place, is the furnishing of a certain quantity of steam for heating and the generation of a certain amount of electricity with this steam before rejection to the heating mains. This two-fold operation must be carried out with a minimum investment in boilers, electric generators and heating mains, and at a maximum year-round efficiency. There will be, no doubt, periods in summer of little or no heating demand. For economical results these periods call for condensing operation. There will be periods in winter when the heating demand is very large. During these periods the generating equipment must be capable of exhausting all the steam required or else the exhaust must be supplemented by steam direct from the boilers. These conditions may be met by utilizing (1), non-condensing apparatus in winter and condensing in summer, or (2) combination steam extracting and condensing apparatus, as the "bleeder" turbine.

USE OF NON-CONDENSING APPARATUS IN WINTER AND CONDENSING APPARATUS IN SUMMER.

The apparatus in (1) may consist, for instance, of one engine or turbine unit operating non-condensing in winter and condensing in summer. Or, it may consist of a condensing unit and a non-condensing unit. The advantage of the first combination is relatively low investment. The advantage of the second is flexibility whereby the electric load may be divided between the two units so that no steam is wasted to atmosphere at times of low heating and high electric demand.

FEATURES OF "BLEEDER" TURBINE OPERATION.

The apparatus in (2) may combine the advantages of both the foregoing combinations but, on the other hand, it may be too costly or too uneconomical when operated condensing. This may be especially true if desired for bleeding very large quantities of steam compared with the normal or condensing steam consumption.

In either case (1) or (2) it may be advisable, in order to reduce the investment, or to secure better summer economy, to supplement the exhaust steam with live steam during the heating peak. In this case the cost of the live steam plus the interest on possible extra boiler investment, must, of course, be balanced against interest on extra investment in generating equipment, or against summer operating economies.

Whatever the type of apparatus in the station, it operating characteristics must be thoroughly understood. This is especially true of the water rate. It is quite obvious that the variation in steam consumption, with variation in electric load, determines the electric capacity required for any heating demand. The variation in steam consumption is further affected by the pressure at which the steam is exhausted to the heating mains and this exhaust or back pressure is the deciding factor in the selection of size of heating mains. The question of investment in mains must then be incorporated in and considered along with all station data.

MODERN PRACTICE RUNNING TO HIGHER STEAM PRESSURES.

As just stated the investment in mains of any given type is, within limits, controlled by the pressure at the station if a fixed pressure at the end of the line is

assumed. It has been customary to consider low pressures desirable, by which is mean pressures from 3 to 5 lbs. gauge. Of late years higher pressures are becoming more common. There seems to be no logical argument against higher pressures of, for instance, 25 to 30 lbs. gauge. The increase of radiation loss per square foot of main due to higher steam temperatures may be balanced by the reduction in square feet of radiating surface compared with the large-size low-pressure main. If the higher pressures are used it may be advisable to install pressure-reducing valves in services using this high-pressure steam.

In general, it may be said that the mains need not be the thing which sets a limit to the maximum pressure to be used. If it is found advisable to feed live steam into the mains at the plant during the heating peak, the effect is to increase the initial or plant pressure. This live steam may be fed in at some distant point by installing an auxiliary live steam feeder-main.

In this case the pressure at the plant need not be increased which may be an advantage to the generating units.

SUMMARY OF CONDITIONS.

To summarize the situation, the size of the main is decided by the initial or plant pressure. The initial pressure is, to a large extent, controlled by the type and size of the electric generating equipment. The design of the mains is further affected by the fact that the steam need not be all exhaust but may be supplemented by live steam. It is evident that plant and main design are inextricably tied together and that the right combination has not been reached until the sum of the interest on investment in the total equipment and yearly maintenance charges and operating expense is a minimum.

The foregoing observations as stated in the beginning, apply primarily to the plant where the demand for heat has kept pace with the demand for electricity. There are a number of variations of this case. The first is a plant where the electric load has so far outgrown the heating load that the units of the right size to furnish exhaust steam for heating would represent a very small per cent of the total electric capacity. A careful study of such a plant may indicate that the economies of combined operation may be negligible and a straight live steam plant is best. The second case is the reverse of the first—that is, the heating load is in excess requiring the use of live steam. A third case is that of the central heating plant in the rather small town, where the electricity is furnished by a transmission line from a large plant and the local electric apparatus is no longer of value, even for standby purposes. This may lead to a straight live steam plant but, in some cases, has brought about the abandonment of the heating plant entirely.

Whatever be the circumstances, it must be clear that a basic survey ought to be made and a foresighted policy established in every plant. Then changes will be only according to plan and much of the haphazard work prevented which in the past has often led to the characterization of the heating business as undesirable and unprofitable.

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IN TIMING the enlargement of THE HEATING AND VENTILATING MAGAZINE with this issue, we feel that we have hit upon a most happy coincidence, for at is turns out, it comes just when the business world is facing what will, in all probability, be its greatest and most successful year. Plans for the new size of the magazine were completed as long as six months ago and the outlook was not nearly so clear then as it is to-day. It was a time for careful consideration, when many business men looked to the future with the greatest anxiety. We can boast now that we had the vision to take the forward step, but in reality we can lay claim to nothing more than an abiding faith in the common sense of the American people. The industrial world is not yet over its trouble, but one thing is certain—we have passed the crisis of the Red Threat. With that danger over, a way will be found, we feel confident, to compose the differences of Capital and Labor, sufficiently, at least, to permit America to take advantage of her present unparalleled opportunities.

THE HEATING AND VENTILATING MAGAZINE graduates into its new size just fifteen years and six months from the day it was founded. At that time vapor heating was just coming into prominence and air conditioning was a term that had to be explained. The heating engineers, to be sure, had banded themselves together some years previously but their ranks were none too full and their struggle for existence occupied too much of their time to permit of efforts to secure recognition through any broad widening of their activities.

How different is the situation to-day. We now find the industry in the forefront of the engineering world, ranking with many of the professions in even larger fields. We have our Research Laboratory where work is going on that will not only enhance greatly the profession as a whole, but which will enlarge its scope to an extent hardly realized at the present time. It is only necessary to mention the branches of food drying and the many possible applications of air conditioning to get a glimpse of the harvest ahead of us. Along with that aspect of the situation, we are greeted with the inspiring announcement of gains in building construction throughout the country that throw into the shade our bravest hopes.

The time has gone by when we could wonder what the New Year would bring forth. The New Year has already made her master effort in presenting the prospect of a year of incomparable prosperity. We trust every man in the heating profession and trade will share fully in the good things coming and that he will not lack the courage to answer the call of Opportunity in this year of grace 1920.

AN ITEM of more than passing significance appeared in the newspapers recently in connection with the revised health code in New York City. It was to the effect that landlords must in the future provide a temperature of 70° F. in living houses during the winter season. New York has, perhaps, suffered more than its share from the ravages of speculative builders, whose plans always stop short of adequate heating plants for their buildings. If the new ordinance should do no more than curb this evil, it would be sufficient to arouse enthusiasm, but as its enforcement will inevitably disclose the inadequacy of thousands of present heating plants, it should prove a source of business amounting to considerable proportions.

The full text of the resolution amending the Sanitary Code is as follows:

Section 225. HEATING OF OCCUPIED BUILDINGS. It shall be the duty of every person who shall have contracted or undertaken, or shall be bound, to heat, or to furnish heat for any building, or portion thereof, occupied as a home or place of residence of one or more persons, or as a business establishment where one or more persons are employed, to heat or to furnish heat for every occupied room in such building, or portion thereof, so that a minimum temperature of 68° F. may be maintained therein at all such times. Provided, however, the provisions of this section shall not apply to buildings, or portions thereof, used and occupied for trades, businesses, or occupations where high or low temperature are essential and unavoidable.

For the purpose of this section, wherever a building is heated by means of a furnace, boiler, or other apparatus under the control of the owner, agent, or lessee of such building, such owner, agent, or lessee, in the absence of a contract or agreement to the contrary, shall be deemed to have contracted, undertaken, or bound himself or herself to furnish heat in accordance with the provisions of this section.

The term "at all such times" as used in this section, unless otherwise provided by a contract or agreement, shall include the time between the hours of 6 A. M. and 10 P. M. in a building, or portion thereof, occupied as a home or place of residence, and during the usual working hours established and maintained in a building, or portion thereof, occupied as a business establishment, of each day whenever the outer or street temperature shall fall below 50° F.

WRINKLES

Natural Ventilation in Photometric Rooms to Admit Air While Shutting out Light.

Natural ventilation for photometric and similar rooms by means of window control, without admitting light, is a problem which may be easily solved by some such method as shown in the accompanying illustrations. As will be seen, the light is continually changed in direction or reflected as often as possible, causing a certain percentage to be absorbed at each reflection until only a small amount is left to enter the room.

Artificial lighting from lamp testing outfits in such rooms causes a considerable rise in temperature within the room which is more noticeable during the summer months. At such times, when it is imperative that no natural light be admitted, the wndows may be opened and the louvres which are built in a recess in front of the windows lowered. Air is then admitted directly from the outside through the spaces formed by successive triangular shaped louvres in which the angle at the apex is made 60 degrees. This

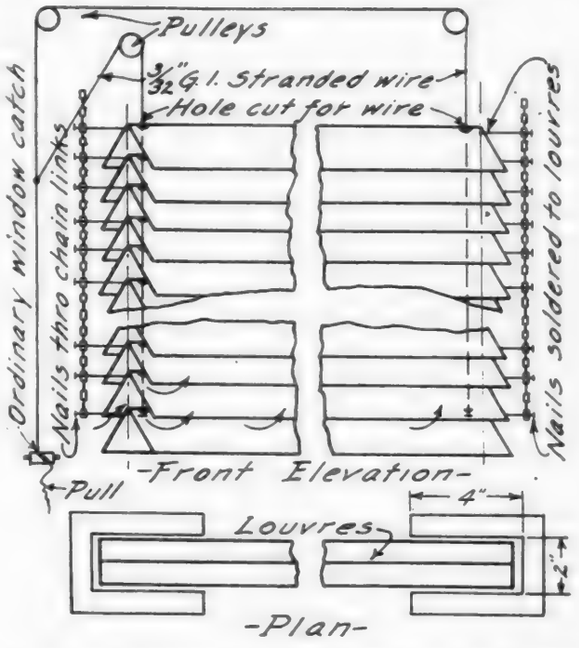


FIG. 1—ARRANGEMENT OF TRIANGULAR-SHAPED LOUVRES FOR ADMITTING AIR TO PHOTOMETRIC ROOMS.

angle causes the light to be received at a favorable angle and turned a maximum number of times.

Ventilation in this instance being affected by lighting, it is in order to note that with light rays, the angle of incidence is equal to the angle of reflection. This determines, as shown in the illustration, the number of times the light is reflected, it being shown that 0.16 of 1% of natural light is admitted to the room when the rays are horizontal. With the sun well up, the amount becomes infinitely small and for the worst condition, which is with light reflected from below, the amount is 4%. The maximum of light absorption is effected by painting the louvres a matt black so that approxmately 80% is absorbed at each reflection.

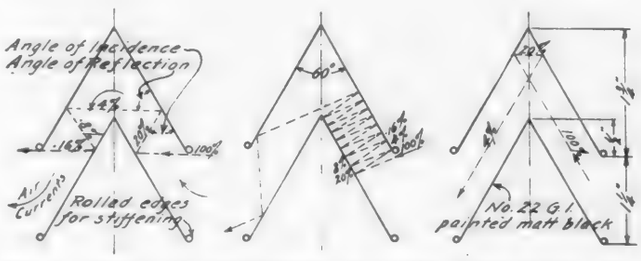


FIG. 2—ANGLE OF INCIDENCE OF LIGHT RAYS WITH TRIANGULAR-SHAPED VENTILATING LOUVRES.

Actual and extensive installation of these louvres have proven their practicability and that light though admitted is negligible in amount and may be observed only within a few inches of the openings. Air enters freely since the free area is practically the entire opening of window and there is no appreciable resistance to its flow.

The louvres are constructed of No. 22 galvanized iron, with rolled edges for stiffening and are spaced and dimensioned as given in the sketches. A wire passing over pulleys is connected through holes to each end of the louvres which, when raised by pulling on the wire, admit full daylight. They are then locked in this position by means of an ordinary window catch or sash pull socket which grips the wire. In lowering, the louvres resume their correct location with respect to one another without binding or sticking, since each is soldered at both ends to the point of a nail which passes through the sash chain.

New York State Personal Income Tax Law.

BY EUGENE M. TRAVIS
State Comptroller

The study of modern heating and ventilating systems demands so much time of consulting engineers and heating contractors that it is quite difficult for them to give particular attention to matters outside of the profession. This situation was considered by the framers of the New York State personal income tax law and it is believed that the statute is drawn up in simple language,

easily understood and also meeting the exgiencies demanding it.

Fees received by engineers and any other compensation for professional services are taxable. Profits derived from construction of plants and installation of systems are likewise taxed. Compensation received as an official or employee of the United States government, and interest from Federal and New York State obligations are excluded when computing gross income.

BUSINESS EXPENSES DEFINED.

Taxpayers may charge off reasonable compensation paid employees and other business expenses and uninsured losses from theft, fire, storm, shipwreck or other casualty. The law allows no deduction for personal, living or family expenses, but when an engineer or contractor in business for himself finds it necessary to travel on account of business matters, he may subtract the railroad fare and lodging expenses, but not the cost of the meals.

The law provides for personal exemptions depending upon the personal situation of the taxpayer. An unmarried man or a married man not living with his wife is entitled to $1,000 personal exemption and a married man living with his wife or the head of a family is entitled to a $2,000 personal exemption. The sum of $200 can be subtracted for each dependent under 18 years of age or who because of mental or physical incapacity, is receiving his sole support from the taxpayer.

The engineer or contractor may be most concerned with the question as to whether or no he must file a return and how computation is made. All income, including taxable and untaxable items, such as interest from Liberty bonds, is classified as total gross income. All taxable income comprises gross income and when deductions for expenses are subtracted, the result is known as net income. An unmarried man having a net income of $1,000 and a married man living with his wife and having a net income of $2,000 must file a return.

For example, an unmarried contractor receives $10,000 for installing a heating and ventilating system. He also receives $2,000 from securities issued under the Federal Farm Loan Act. His gross income is $10,000, the interest from the Farm Loan securities being excluded from taxation. He has business expenses of $4,000 which brings his net income to $6,000. His personal exemption of $1,000 reduces his taxable income to $5,000 and he pays a tax of $50.00. The rates of tax are 1% on the first $10,000 of taxable net income, 2% on the next $40,000 and 3 % on all sums in excess of $50,000. The return must be filed between January 1 and March 15, 1920 and remittance of the tax must accompany the return.

Penalties are imposed for failure to make a return and evasion of the tax. Employees of the Comptroller's office are prohibited under penalty from divulging information concerning a return.

District offices of the Income Tax Bureau are located at Albany, New York City, Brooklyn, Bronx, Jamaica, White Plains, Buffalo, Rochester, Utica, Syracuse, Binghamton, Elmira and Kingston, where blanks and instructions for all classes of taxpayers may be found.

LEGAL DECISIONS

Lien for Heating Plant Material.

While the authorities are not harmonious upon the question of the necessity of material actually going into and becoming a part of the structure in order to support a lien right, the Washington Supreme Court holds, Western Hardware & Metal Co. v. Maryland Casualty Co., 177 Pac. 703, that under the Washington statute as to giving a bond on public work conditioned to pay for "provisions and supplies for the carrying on of such work," a materialman furnishing sheet metal in good faith to be used in the constuction of a school heating plant is entitled to recover on such a bond, though the metal did not go into the plant; "provisions and supplies" including such material, and "for the carrying on of such work" referring to furnishing material in good faith, although by fault of the contractor or subcontractor it does not go into the building. That court also holds that where the materialman delivered sheet metal to the subcontractor at his shop, where efficient molding machines could be had, to be shaped into forms necessary for constructing a school heating plant, the fact that the material was not delivered at the place where the plant was to be installed did not deprive the materialman of the right to recover on the contractor's bond.

Water Heating Rates—Surcharge.

The Indiana Public Service Commission refused to remove in the latter part of the heating season, on the petition of a consumer for a reduction of water heating rates in Indianapolis, a surcharge on the central station water heating rates fixed by the Merchants' Heat & Light Company well in advance of the beginning of the season, and based on increased cost of coal, labor, etc., which had not declined. Increases in the cost of coal and labor, together with providing a small, thorough inadequate allowance for depreciation, was held to re-

quire a rate of not less than 30 cents per square foot of radiation for the season 1918-19. That would yield the company practically nothing on investment. A higher rate necessary to do that would practically be prohibitive, or reduce revenues.

Seasonal Minimum Monthly Charges.

In authorizing a schedule of increased steam heating rates to the B. W. Bissell Co., the Indiana Commission said that it is eminently fair that contracts for heating should carry a minimum monthly charge. Such charges are general in public utility services. They constitute protection to patrons, as well as to the utility itself. Contracts should contain, as part of the stipulation for, and obligation of, service, two minimum charges,—the first to apply to those who remain on the service during the entire season; the second to apply to those who close their places and leave them during part of the heating season. The cost of maintaining and operating the plant, and standing ready to serve on turn of valve, is a constant charge that must be equitably applied to all who elect to avail themselves of central station heating. These two charges can be consolidated. The commission adhered to the theory applied in a prior steam heating case, of distributing the seasonal minimum into monthly instalments, or monthly minimum charges, in proportion to the relative amount of heat used in different months and based on relationship of fixed charges that the company has to carry.

Increases in Rates—Depreciation.

In allowing for depreciation upon an application for increase in rates of a steam heating utility, the Billing's Utility Co., the Montana Public Service Commission included depreciation of 2% on buildings, 10% on pumping equipment, and 5% on other items going to make up the physical part of the plant.

Poor Ventilation Kills Appetite.

Under this title G. C. Breidert, writing in *The American Restaurant,* calls attention to opportunities for the ventilating engineer in the equipment of restaurants with suitable apparatus for maintaining fresh air conditions, especially in regard to the removal of excessive heat and cooking odors.

A well-known owner, he says, of a number of large profitable restaurants stated in answer to a question about his policies—"Poor ventilation and an uninviting atmosphere kills any appetite—never let a patron come in with a 75 cent appetite and walk out with only a 15 cent meal ticket."

In this remark can be seen actual "profits" dwindling away because of false economy. It is hard to conceive of anything that is more resented than those greasy fumes and cooking odors which permeate throughout a restaurant where proper ventilation is lacking.

Many people perhaps are forced to dine in these conditions. This is due to the lack of restaurant competition. Notwithstanding the "upper hand" position many restaurant owners enjoy, they nevertheless are face to face with a lower revenue than

FIG. 1—DISCHARGING KITCHEN ODORS AND HEAT THROUGH PROPELLER FAN IN WINDOW.

might be enjoyed by creating an inviting and appetizing atmosphere. This is obviously so, according to the statement in the opening paragraph.

Where competition prevails, the restaurant offering the best food at consistent prices served in an atmosphere that is inviting and appetizing, usually attracts the bulk of patronage. Appetizing food, modern furnishings and good service, however, count for nothing if the air in a dining room is contaminated with greasy fumes and conglomeration of cooking odors.

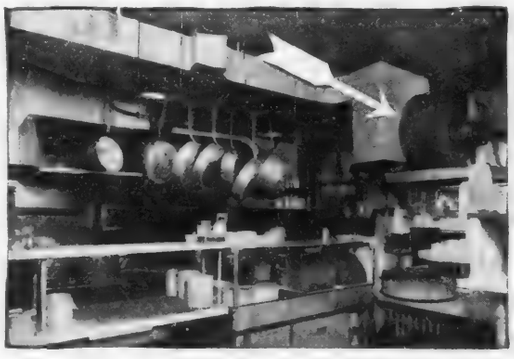


FIG. 2—TYPICAL BLOWER INSTALLATION IN CONNECTION WITH HOOD OVER RANGE.

An effective system does not necessarily mean that the cost is beyond means. On the contrary many locations of kitchens are ideal for proper and economical systems.

The matter of patrons' comfort, of course, should be foremost in the minds of restaurant operators. There are, however, several other factors which make ventilation a necessity rather than is erron-

eously supposed,—a secondary consideration. Numerated they are as follows:

1. Poor ventilation spoils foodstuffs.
2. Excessive heat increases ice box bills.
3. Heat and lack of ventilation is irritating and lowers the efficiency of kitchen help.
4. Greasy fumes spoil decorations.

Take these points up in their consecutive order. In the first instance—"poor ventilation spoils foodstuffs." By this is meant that any prevailing odors and foul air have a very penetrating effect. Hence butter, eggs and pastry often have an unnatural taste. In addition to this, fresh meats and vegetables will decay more rapidly when exposed to high temperatures naturally existing in a kitchen. This condition, of course, is present every day and is preventable.

The second point—"excessive heat increases ice box bills"—is one that confronts most restaurant owners. It is easily recognized that an ice box exposed to high temperature will melt more ice than one situated in a cooler atmosphere. The saving of ice, of course, is a matter that is not insignificant.

The third point is one that is to be considered seriously. The question of "labor" today is most perplexing. Help is scarce and inexperienced. Even without considering this present day situation—it is a physical impossibility to work hour after hour in a space where high temperature prevails without becoming irritable and nervous. Naturally then, help thusly affected cannot perform their duty harmoniously.

In the fourth point we again can see where an actual saving is to be gained by installing a ventilating system. When greasy fumes are not exhausted from the kitchen they permeate everywhere, leaving a film of grease to which dust and dirt clings thickly and solidly. A well ventilated room is usually entirely free from dust, etc., consequently it is not necessary to redecorate often, wherein lies a big saving.

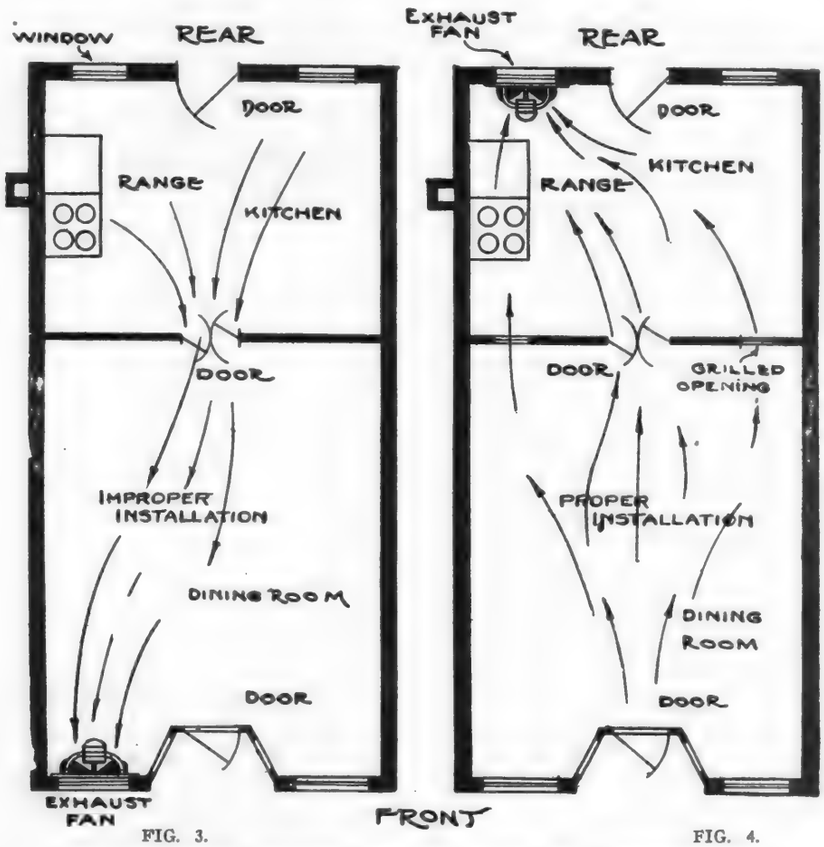


FIG. 3. FIG. 4.

INCORRECT AND CORRECT WAYS TO VENTILATE A RESTAURANT.

When you speak of ventilation, most restaurant and cafe owners associate it with "hot weather," or a requirement for mid-summer. This is absolutely incorrect. True the conditions mentioned are intensified. However, they are not obliterated or anywhere near so during other seasons of the year. In other words, the need of correct ventilation is always necessary for the many good reasons mentioned.

In most cases, the cost of a proper system of ventilation is surprisingly low. Often failure to install a ventilating system by an established restaurant makes it comparatively easy for a new owner to successfully compete for patronage.

MECHANICAL VENTILATION ESSENTIAL.

There are two ways to secure ventilation, one by natural means, the other by mechanical operation. The former is seldom effective and depends entirely on weather conditions. The latter is rapidly being adopted everywhere. Mechanical ventilation may be accomplished with either exhaust fans or blowers.

The determining factor depends on location and layout of the kitchen. A most effective and economical system can be made by installing exhaust fans of the propeller type, large enough to change the air every two minutes. If it is impossible to install this type of fan so that it can discharge directly outside, it will then be necessary to use a blower type. The latter may be connected up with a system of duct work which will convey the air to the roof or exterior where the kitchen odors will be undetected.

In Fig. 1 is shown a propeller fan installed in a window. In this case the kitchen odors and heat are discharged directly outdoors. A fan of this type should always be placed directly over, or as near to the range as possible so that it will exhaust the elements before they have a chance to circulate elsewhere. Fig 2 is a typical blower installation in connection with a hood over the range. In this case the air is discharged through a duct up to the roof.

In Figs. 3 and 4 are shown a correct and incorrect way to ventilate a restaurant. Owners sometimes make a mistake by installing the fan in the front of the dining room. Naturally the odors in the kitchen, as can be seen, would be pulled from the rear to the front. While the air would actually be changed, it, however, would not be of a fresh nature, as the kitchen is not a source of fresh air supply. The correct way, as will be noted, is to install the fan in the kitchen as near to the source of evil as possible as indicated in the sketch.

As an illustration, a kitchen is 25 ft. wide, 20 ft. long and 14 ft. high, contains 7000 cu. ft. of air space. In order to change the air in this room every two minutes it would require a fan with a capacity of 3500 cu. ft., per minute. To arrive at this, all that is necessary is to first find the cubic foot space of the room to be ventilated. Then divide this by two, which gives the capacity of a fan necessary to change the air every two minutes.

Dining room ventilation is usually figured on a five-minute air change basis. By proper ventilation in the kitchen it is not necessary to ventilate the dining room separately, only in cases where the kitchen is located on another floor or in some other part of the building.

The Value of Sheet Asbestos on Hot Air Pipes.

While conducting some simple tests at the Westinghouse Research Laboratory, on the relative thermal resisance of layers of asbestos paper when applied loosely and tightly, respectively, some interesting results were obtained by T. S. Taylor, research physicist at the laboratory. In the preliminary tests it was observed that a bare tin vessel containing hot water would cool less rapidly than the same vessel when wrapped tightly with one layer of 0.023-in. sheet asbestos.

This observation, which is just the opposite to the usual ideas held by most engineers, was carefully checked by filling up identical tin vessels, one being left bare and the other covered tightly with sheet asbestos, and then obtaining the cooling curves for each when placed under similar conditions. The uncovered one cooled much more slowly than the one covered with asbestos.

However, to obtain results from conditions more nearly like those met in practice, heaters were made so as to slip into vessels 4 in. in diameter and 20 in. long, and the temperature excess of the air at the center of the vessel above room temperature measured for various inputs and surface conditions.

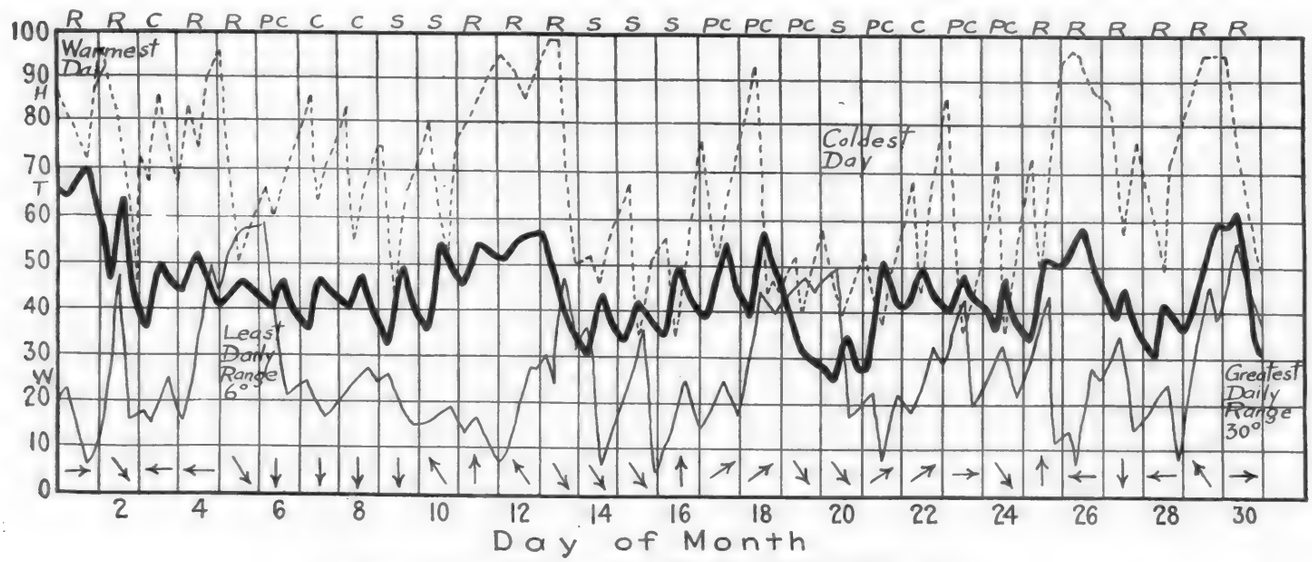
From these tests it has been found than an asbestos-covered hot air pipe loses 33% more heat from its surface than a bare one. To reduce the heat loss of the covered pipe so as to be equal to that of the bare pipe would require a coating of asbestos, as usually applied, at least 1/16-in. thick. To make the heat loss of the asbestos-covered pipe three-quarters that of the bare one would require a layer of asbestos about 1/9-in. to 1/8-in. thick. However, if the asbestos is put on loosely, three layers of 0.013-in. asbestos paper will reduce the heat losses to practically those of a bare pipe. Even with a dust-covered surface, such as usually exists on warm-air furnace pipes, the asbestos-covered pipe will lose at least 20% more heat than the bare one.

The results show that it is not economical to cover warm-air pipes with the usual thin layer of asbestos, not only on account of the initial cost of material and labor, but on account of heat losses later. Calculations based upon the data obtained indicate the possibility of reducing the heat losses so that there will be a saving of one ton of coal in sixteen.

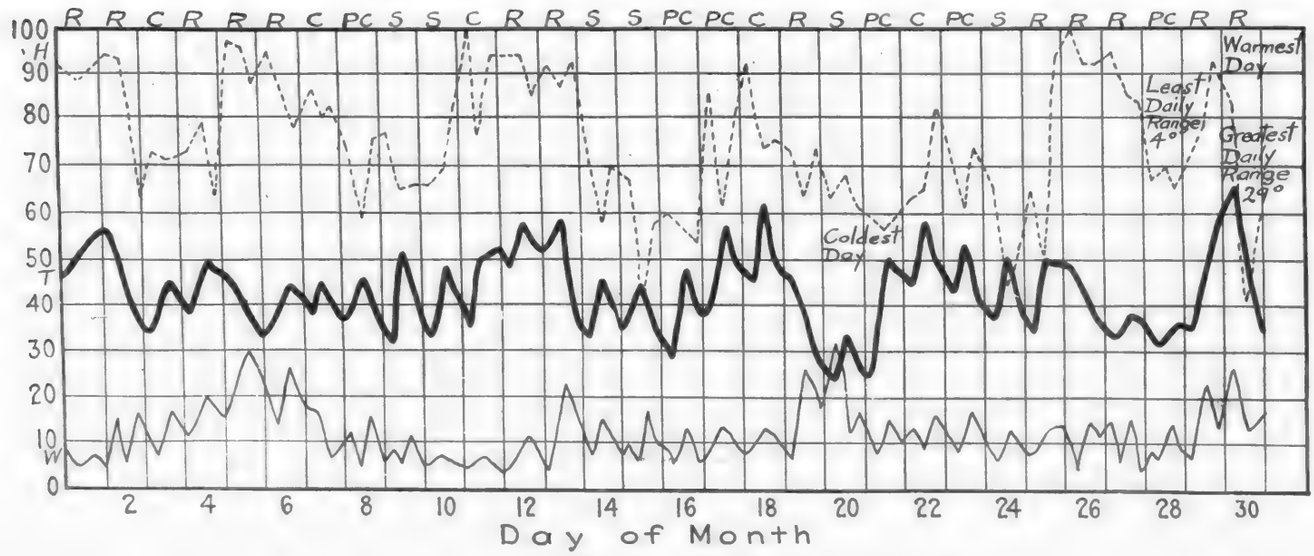
These characteristics are being investigated in more detail and a more complete report of the experiments will appear shortly.

THE WEATHER FOR NOVEMBER 1919

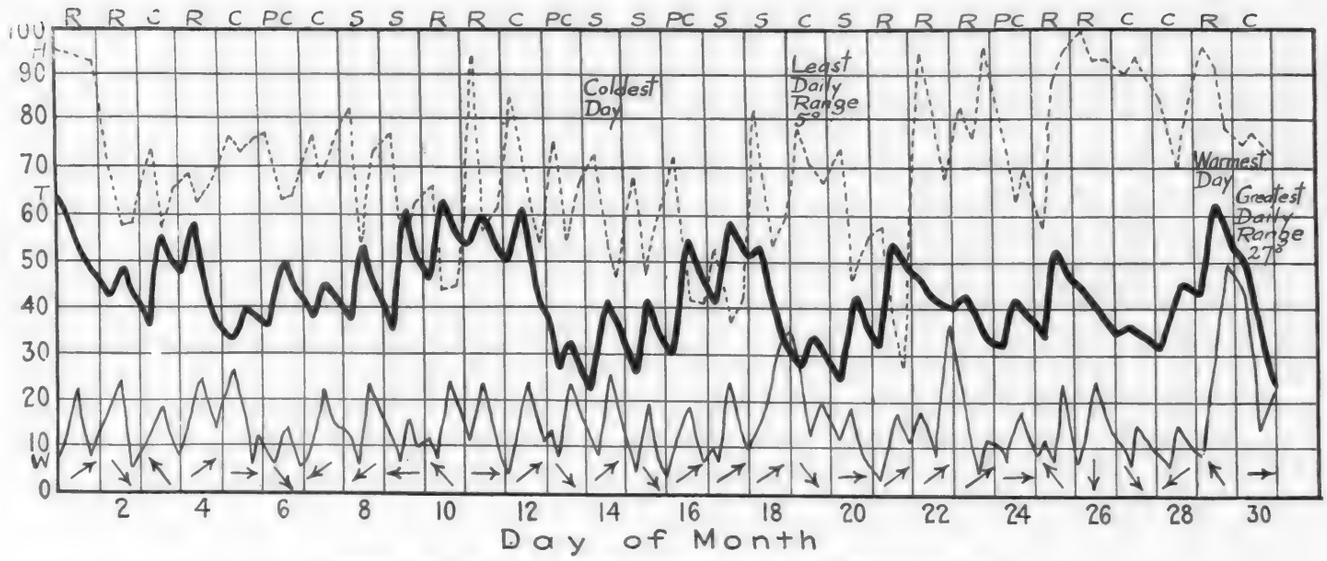
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	70	65	65	60	68
Date of highest temperature	1	30	29	10	3
Lowest temperature, degrees F.	26	25	23	15	20
Date of lowest temperature	20	21	14	30	13
Greatest daily range, degrees F.	30	29	27	36	31
Date of greatest daily range	30	30	30	29	29
Least daily range, degrees F.	6	4	5	2	4
Date of least daily range	5	28	19	27	8
Normal temp. for month, degrees F.	44.4	43	43	39.2	44.8
Normal mean temp. for month, degrees F.	44	41.2	42.9	39.2	43.4
Total rainfall, in.	3.33	5.36	3.82	2.38	2.08
Total snowfall, in.	Trace	0.2	0.5	0.6	Trace
Normal precipitation, this month, in.	3.44	4.1	2.55	2.5	2.88
Total wind movement, miles	14254	8059	8926	10908	9801
Average hourly wind velocity, miles	19.8	11.2	12.4	15.2	13.6
Prevailing direction of wind	N. W.	N. W.	S. W.	W.	N.W.
Number of clear days	7	7	7	9	14
Number of partly cloudy days	9	7	6	8	6
Number of cloudy days	14	16	17	13	10
Number of days on which rain fell	19	12	11	8	7
Number of days on which snow fell	1	1	1	4	Trace
Snow on ground at end of month, in.	None	None	None	None	None



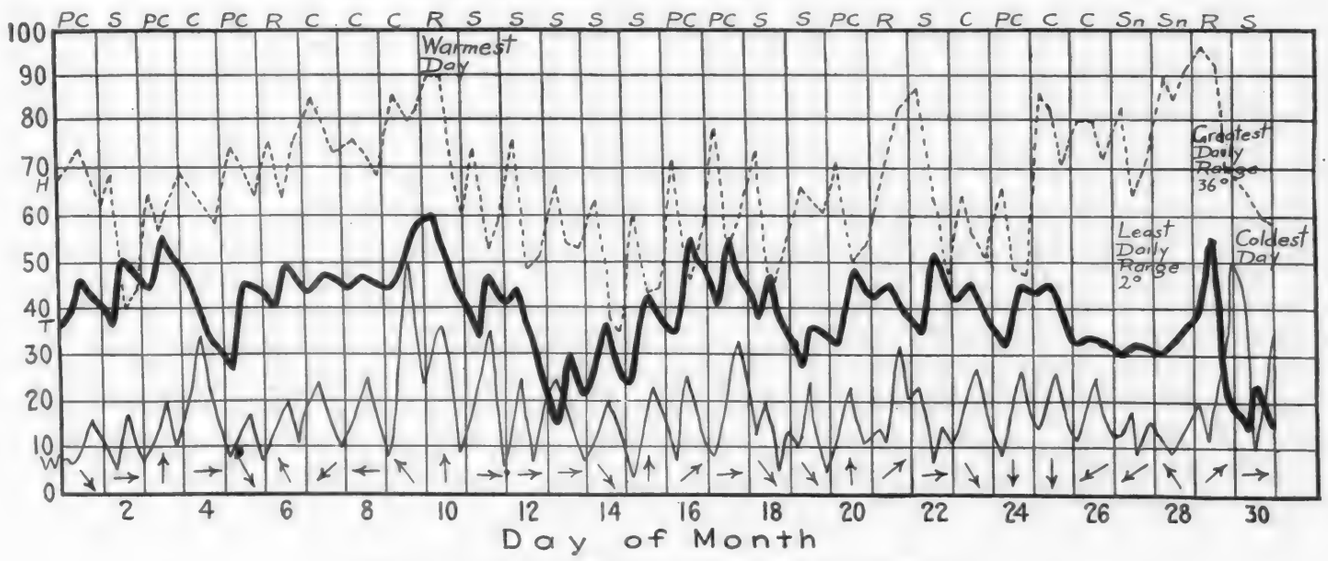
RECORD OF THE WEATHER IN NEW YORK FOR NOVEMBER, 1919
(Hourly Observations of the Relative Humidity Plotted on this Chart.)



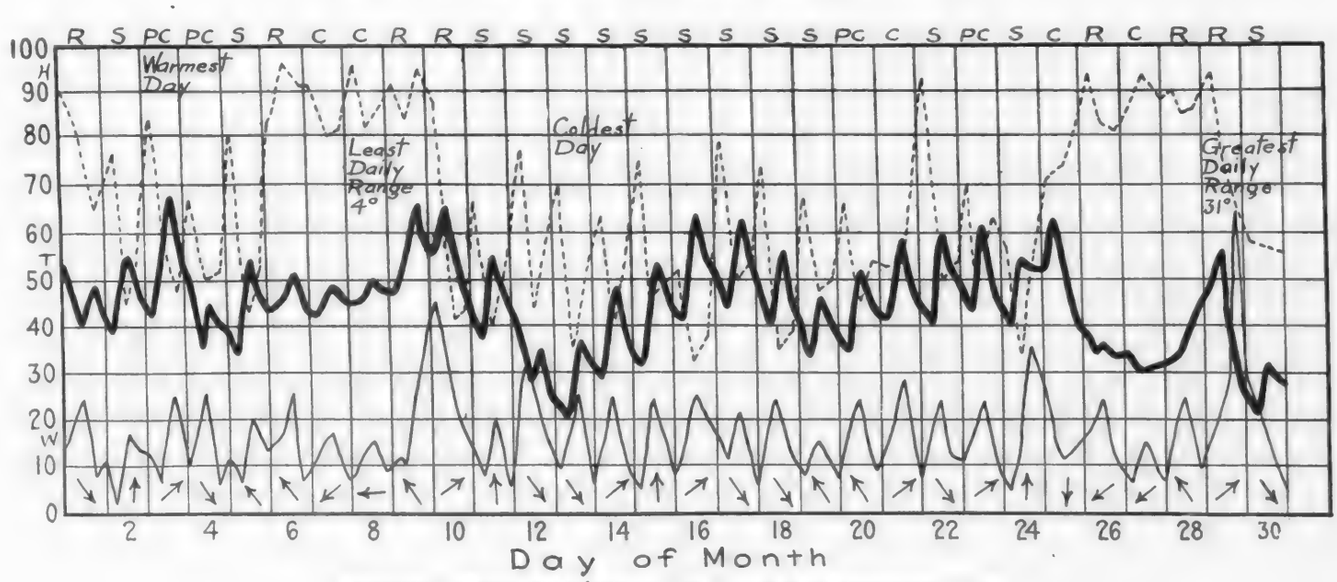
RECORD OF THE WEATHER IN BOSTON FOR NOVEMBER, 1919



RECORD OF THE WEATHER IN PITTSBURGH FOR NOVEMBER, 1919.



RECORD OF THE WEATHER IN CHICAGO FOR NOVEMBER, 1919.



RECORD OF THE WEATHER IN ST. LOUIS FOR NOVEMBER, 1919

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P.M.
S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.

XVIII. THE BISHOP AND BABCOCK VACU-VAPOR SYSTEM.

An unusual choice of devices is offered in the Bishop & Babcock vacu-vapor system of steam circulation which renders it suitable not only for various classes of work, but also for different degrees of refinement. Two types of radiator return traps, for instance, are furnished, the Vacu trap and the Multiflex return trap. The Vacu trap, however, does not have all the fine features of the Multiflex return trap, although it is described as efficient and desirable for any Bishop & Babcock vacu-vapor installation. Again, the system includes two types of radiator supply valves, one a packless graduated valve and the other a modulation valve, the principal difference being that the packless graduated valve opens with one-quarter turn of the handle, while the modulation valve opens with one full turn and is fitted with a device for indicating when it is one-quarter, one-half, three-quarters and full open.

Two types of vent traps are also adaptable for this system, the B. & B. automatic vent trap and the 4-V vent trap. The automatic vent trap has a venting capacity of 1500 sq. ft. of direct radiation, while the 4-V vent trap will handle vapor heating systems up to 2500 sq. ft. of direct radiation, as well as air line systems not exceeding 800 sq. ft.

A typical layout of this system using modulation valves, vacu-traps and a 4-V vent valve is shown in Fig. 1. The boiler, boiler connections and supply piping are the same as for an ordinary steam plant. The water of condensation passes down to the wet return from the main and flows back to the boiler, while the air is relieved through the vacu trap into the dry return main. The air is then passed out from the system through the 4-V vent valve. This valve is automatic and is designed not to permit the return of air into the system.

The return traps on the radiators operate in the usual way, being normally open to drain the radiator of air and water of condensation as fast as they accumulate, and automatically closing against steam or vapor.

Should the pressure at any time creep up on the boiler sufficiently to prevent the return of the condensation to the boiler, due to insufficient static head, an alternating receiver which is a part of the system, acts to automatically return the condensation to the boiler.

A special Multiflex damper regulator is used to control the drafts and check dampers so as to maintain an even vapor pressure. With a constant vapor pressure much or little heat can be supplied to any radiator by operating the modulation valve.

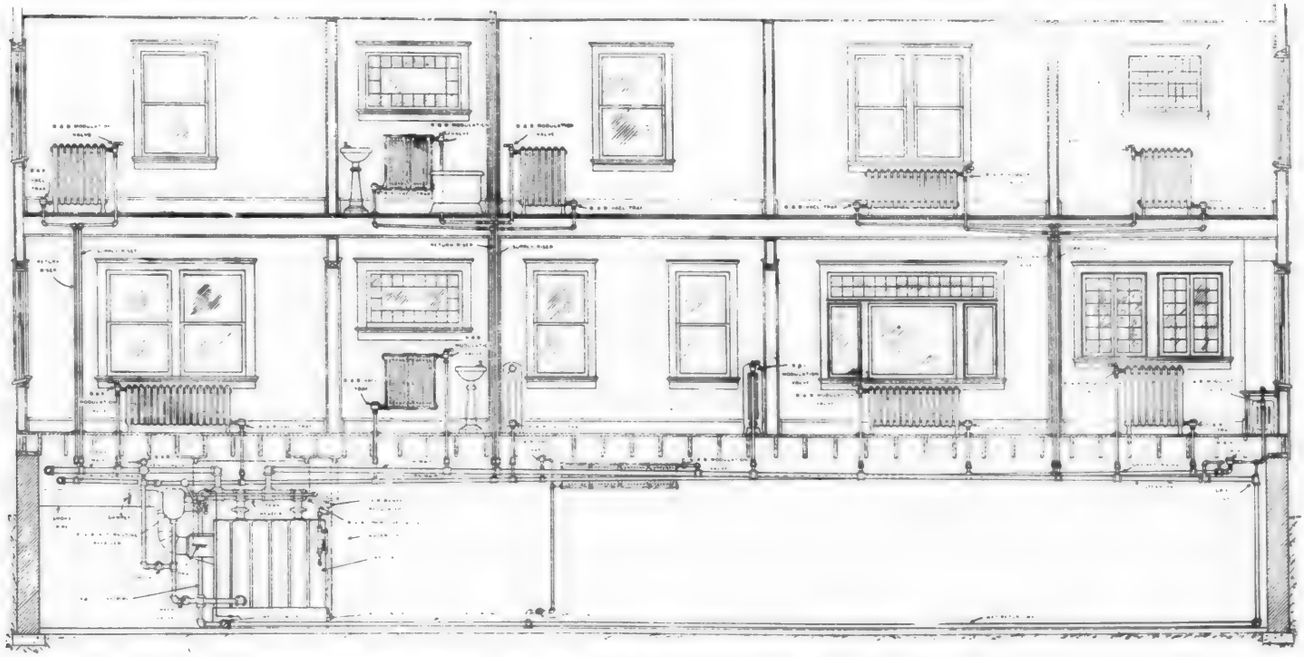


FIG. 1—TYPICAL LAYOUT OF B. & B. VACU-VAPOR HEATING SYSTEM.

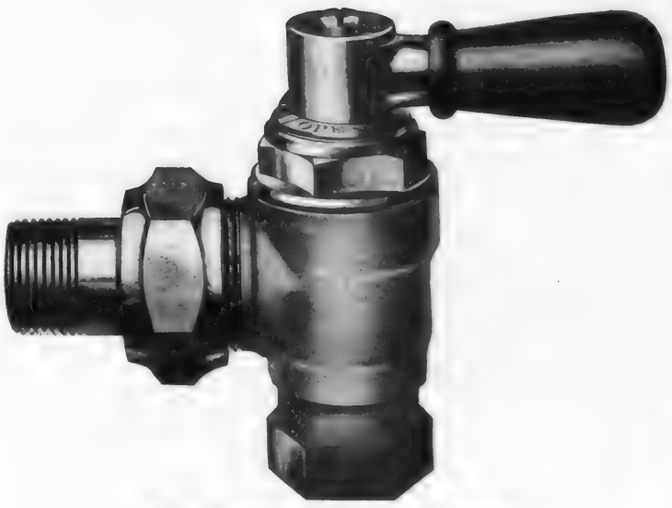


FIG. 2—GRADUATE PACKLESS VALVE.

CONSTRUCTION OF DEVICES USED.

Taking up the construction of the devices used in this system the Multiflex trap has a number of interesting features. For instance the thermal member of this trap is made into the shape shown (Fig. 5) from a special, composition brass disc, being tempered during the operation in changing the disc to a tube of fourteen corrugations. The movement from full open to shut is distributed over 28 surfaces, so that the deflection on any one surface is extremely small. Both this trap and the radiator vacu-trap (Fig. 4) are of all metal construction and are suitable for carrying varying steam and vacuum pressures. It is also pointed out that they have a high lift, thus contributing to their self-cleaning features. Due to their large openings they have an unusual capacity.

Each of the two types of radiator supply valves has characteristic features. The packless graduated valve (Fig. 2) is readily adaptable for connection either at the top or bottom inlets to the radiator, depending on whether steam or water radiators are used, although the manufacturers recommend the use of water radiators with this

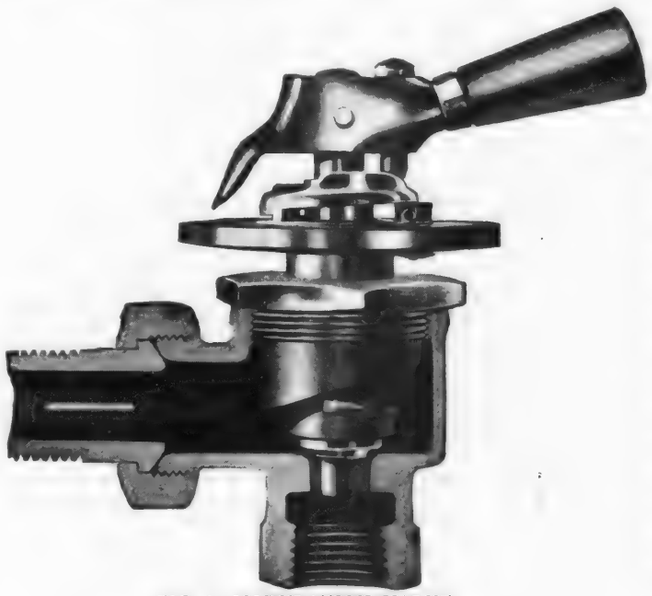


FIG. 3—MODULATION VALVE.

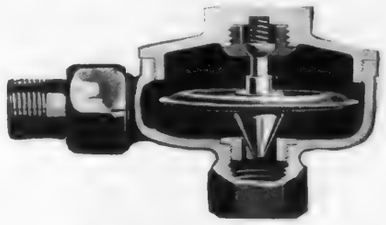


FIG. 4—VACU TRAP.

system. As stated, one-quarter turn will open or close this valve. It is made packless by having the seat above the valve stem which is always held in place by an extra heavy spring. The other type of radiator supply valve, the modulation valve, which opens and closes with one full turn, is adjustable through the manipulation of the adjusting screw up or down so that it will supply a larger or smaller volume of steam, as desired, to the unit to which it is attached.

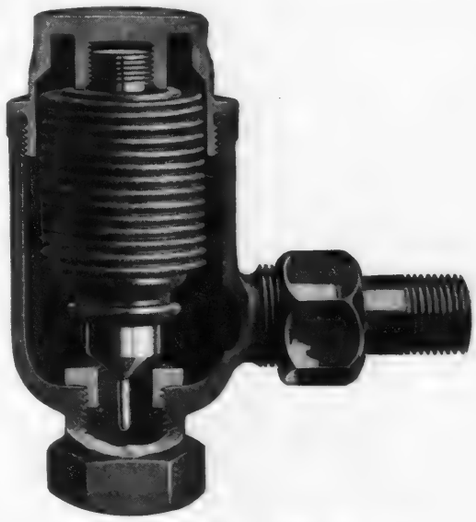


FIG. 5—MULTIFLEX RETURN TRAP.

The system, as has been noted, is vented through an automatic vent trap (Fig. 6) or through a 4-V vent valve (Fig. 7). The automatic vent trap may also be used on systems having a vacuum pump so that when the vacuum pump is shut down and the by-pass open to the boiler, the air may be relieved from the system. The trap is installed at the low point of the dry return and this low point should never be less than 30 in. between the waterline of the boiler and the low point of the dry return. The trap is of all-metal construction, the body being a heavy casting metal construction, the body being a heavy casting tapped 1¼ in. for the inlet connection. The cover, which is of brass, contains a ball check valve and seat to prevent the return of air back into the

system after the air has passed out. Should the condensation accumulate in large quantities in the return, due to excess pressure, the float rises and closes the valve, thus preventing the water of condensation from overflowing on the boiler room floor. The trap has a venting capacity of 1500 sq. ft. of direct radiation.

FIG. 6—AUTOMATIC VENT TRAP.

Where larger capacity is desired the automatic vent trap is used, its capacity being 2500 sq. ft. of direct radiation. This trap is also adaptable for use on systems having a vacuum pump, operating to relieve the air from the system when the pump is shut down and the by-pass opened to the boiler.

FIG. 7—4-V. VENT VALVE.

The composition float ball used with the 4-V vent valve is not affected by hot condensation. The importance of this is evident when the water of condensation accumulates in the return piping due to excess pressure. In that case the float will rise and close the water valve and prevent the escape of water. This, it is pointed out, eliminates the necessity of connecting a stand-pipe known as the overflow sometimes used on vapor systems.

Of the other devices used, such as the compound gauge graduated to 15 lbs. steam pressure on one side and 30 in. vacuum on the other, the multiflex damper regulator (Fig. 8) and alternating receiver, (Fig. 9) it may be said that the

FIG. 8—DAMPER REGULATOR.

damper regulator has the same desirable features as the Multiflex return trap in the way of a corrugated diaphragm. The alternating receiver, for returning the water automatically to the boiler, comes into service when any accumulation of pressure on the supply side causes condensation to collect in the returns. If this were not taken care of, it is readily seen that the system would become air

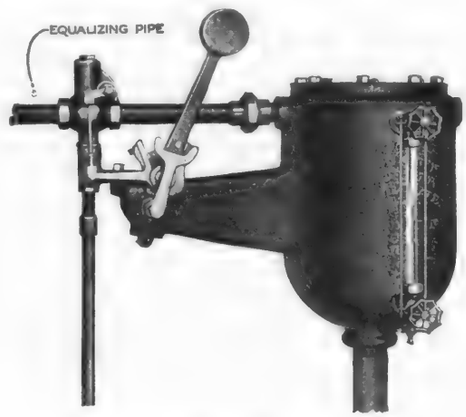


FIG. 9—ALTERNATING RECEIVER.

bound, causing a portion of the radiators to cool, regardless of the pressure carried on the boiler. Inability to overcome this difficulty, it is stated, has been the real reason why modulation systems have not been more generally adopted for residences and similar types of buildings.

The alternating receiver (Fig. 9), it will be noted, is connected to the return main, near the boiler. Should the boiler pressure increase, the condensation rises in the receiver, raising the float. This action raises a weighted lever until the lever falls over by gravity and opens the steam valve, allow-

ing the steam to pass into the receiver. The pressure in the boiler and the receiver are thus equalizd and the condensation flows back to the boiler by gravity without collecting in the return mains, whether the boiler pressure is 2 lbs. or 10 lbs.

The capacities of valves and traps as applied to this system are given as follow:

GRADUATED VALVES OR MODULATION VALVES.

Size, Inches	Direct Radiators, Sq. Ft.	Direct Indirect Radiators, Sq. Ft.	Coils or Wall Radiators, Sq. Ft.
¾	0 to 60	0 to 40	0 to 50
1	61 to 120	41 to 80	51 to 100
1¼	121 to 200	81 to 140	101 to 160
1½	201 to 350	141 to 230	161 to 280

VACU TRAPS.

Size and Number	Direct Radiators, Sq. Ft.	Direct Indirect Radiators, Sq. Ft.	Indirect Radiators, Sq. Ft.	Coils or Wall Radiators, Sq. Ft.
½-in. 0	0 to 100	0 to 70	0 to 60	0 to 80
½-in. 1	101 to 150	71 to 100	61 to 90	81 to 120
¾-in. 1	151 to 400	101 to 260	91 to 230	121 to 320
1-in. 1	401 to 800	261 to 550	231 to 460	321 to 640
1¼-in. 1	801 to 1600	551 to 1000	461 to 800	641 to 1200

Annual Meeting to be Held January 27-29 in New York.

Plans for the forthcoming meeting of the American Society of Heating and Ventilating Engineers, which will be held in the Engineering Societies Building, New York, January 27-29, provide for special sessions on fuel-oil and engineering cooperation. A prominent place will, of course, be given to the work of the society's Research Bureau which commenced operations last August at the Bureau of Mines Experiment Station in Pittsburgh under Director John R. Allen. The program of the work to be accomplished by the Research Bureau has already assumed large proportions and while it is as yet too early to expect definite results, a general outline will be given at the annual meeting of the order in which the various investigations are being taken up, and the progress made to date.

Officers Nominated for 1920.

Nominations for officers of the American Society of Heating and Ventilating Engineers for 1920 are as follows:

For president, E. Vernon Hill, Chicago; for first vice-president, Champlain L. Riley, New York; for second vice-president, Jay R. McColl, Detroit; for treasurer, Homer Addams, New York; for members of the council: William H. Driscoll, New York; Joseph A. Cutler, Chicago; A. C. Edgar, Newton Square, Pa.; Alfred S. Kellogg, Boston; George B. Nichols, Albany, N. Y.; R. W. Pryor, Jr., New York; Perry West, New York; and W. S. Timmis, New York.

The result of the election, which is by mail ballot, will be announced at the annual meeting of the society.

Nominations for this year's class on the society's Committee on Research, which has charge of the work at the Research Bureau in Pittsburgh, are as follows:

G. E. Bennitt, B. C. Davis, S. E. Dibble, A. T. Lewis and G. W. Martin. The council has also nominated W. S. Timmis to fill the unexpired term of William F. McDonald, who died soon after his appointment last year.

New York Chapter Visits St. Bartholomew's.

A novel idea in the way of an engineering meeting was successfully carried out in connection with the December meeting of the New York Chapter, held December 15 at the Building Trades Club. It had been arranged, after the routine business had been disposed of, to proceed in a body to some representative heating and ventilating installation and go over the plant in the company of the designing engineer. St. Bartholomew's Church, at 49th Street and Park Avenue, was selected for the visitation, the mechanical equipment for which was designed by Meyer, Strong & Jones. Henry C. Meyer, Jr., of that firm, was a guest of honor at the dinner and accompanied the party to the church.

Mr. Meyer described the system in a general way, pointing out its most interesting features. The party visited the main auditorium, chapel, Sunday School rooms and various rooms in connection with the church proper, such as the rector's study, assistants' rooms, choir rooms, etc.

The main auditorium of the church, it was explained, is heated and ventilated entirely by a blower system, fresh filtered air being blown to various parts of the building by means of a fan. The heating coil consists of a primary coil, part of which is under the control of a thermostat located in the cold air chamber, the remainder being under the control of a thermostat in the fan discharge; the purpose of both thermostats being to maintain a temperature of about 65° to 70° in the fan discharge.

The main hot air duct is split into seven main branches, each having a supplementary coil and discharging air to the various parts of the church through registers located high up on the walls of the nave, transepts and chancel. Each of these supplementary stacks is controlled by a thermostat located in the exhaust duct from the corresponding part of the church.

Air is exhausted from the church by wall registers along the outer walls and also by registers at the entrances to the pews along the center aisle. A fan is provided to discharge this air to the roof. There is also a connection between the main exhaust duct and the primary coil of the supply system, so that an internal recirculating system may be used.

The other parts of the building are heated by direct radiation and in the chapel, Sunday School and other important rooms, there is a tempered

air supply for ventilation, with exhaust for withdrawing the used air.

The discussion also brought out the fact that the air required for the organ often presents a serious problem in church work, owing to the fact that the organ builders object to any interference with either the air supply to the organ or its disposition after passing through the organ tubes. As a result, he said, in this instance, large quantities of cold air pass through the organ during the church service which have to be taken care of in the general ventilation scheme.

The party was then taken downstairs where an inspection was made of the apparatus which elicited many expressions of admiration for its arrangement and construction. At the conclusion of the inspection a vote of thanks was tendered to Mr. Meyer for his courtesy in making the visitation possible.

The meeting at the Building Trades Club was opened by President Perry West who urged further action by the chapter in connection with the efforts of the engineering profession to assume its place of leadership in the critical times facing the industrial world. The present situation, he said, means that the human machine is breaking down and that it needs a survey from start to finish. The engineer, he said, is the man to make this survey. As a means towards furthering this work, he suggested the appointment of a committee to formulate some concrete plans in connection with co-operation among engineers to be presented at the annual meeting of the heating engineers society in January. This suggestion was adopted, as well as one to appoint another committee to continue the investigation of the use of fuel oil as a substitute fuel.

Frank T. Chapman then told of the action taken at the recent meeting of the American Society of Mechanical Engineers in adopting a definite program for co-operation of that body with capital and labor. He represented the resolutions that were adopted by the mechanical engineers which were endorsed by the chapter. He then presented Charles Ferguson, whose address on the industrial situation at the October meeting of the chapter aroused such wide interest.

Mr. Ferguson started out by saying that in future years it would be a matter for wonder that we have not had before this an organization interested on a national scale in the productive process. Financiers have been extending their credit capital unhindered especially during recent years to the point where it has become all the traffic will bear and then some. Organized labor, on the other hand, has also followed its selfish interests, also striving to get all the traffic will bear. While this has been going on, there has been no organized effort to improve the processes themselves, no agency interested primarily in producing goods.

Europe, he said, is practically down and out industrially. It would do little good at present to arrange for extensive credits there because there is lacking the necessary industrial morale to promote what he termed "continuing productivity." He told of the recent formation of an international corporation to revive the industrial life of Poland. This body is incorporated both in New York and in Warsaw. This move, he said, if successfully carried out, will eventually become the controlling force in that country.

Engineers, he said, have too long been the upper servants of those who administer finance. It is up to them to create and become the leading factors in an organization for maintaining continued production.

Mr. Ferguson told of the recent conference of engineers with Samuel Gompers, head of the American Federation of Labor, in which it was emphasized that general strikes do not further productivity and that labor must stand with the engineer in evolving the new basis on which business must be conducted. The favorable impressio made upon Mr. Gompers, he said, was reflected in the action taken later at a conference of labor leaders in Washington in which they urged the establishment of closer co-operation between the "scientists of industry" and representatives of labor. It now remains to bring capital into line and get financiers to realize that the principal source of credit is not landed estate but credit capital. The center of gravity, in other words, has shifted from saved capital to credit capital. What is now about to happen, he concluded, is that the control of credit capital is to become the sovereign function of modern society and in the future the place of the financier at the head of the executive boards in industry is to be taken by the engineer.

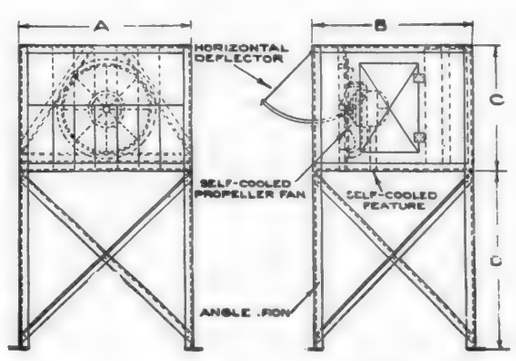
The meeting was then turned over to A. S. Armagnac for the visitation to St. Bartholomew's.

Illinois Chapter Discusses Unit Heaters.

Unit heaters occupied the center of attention at the December meeting of the Illinois Chapter which was held December 8, at the Engineers' Club Chicago. The meeting attracted 51 members and guests fourteen of whom were elected to membership at the meeting.

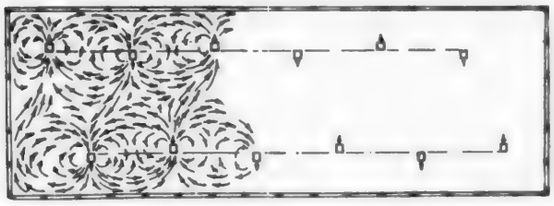
The principal speaker was J. M. Frank, vice-president of the Ilg Electric Ventilating Co., Chicago, which has specialized in the development of unit heaters.

Mr. Frank, who was introduced by C. C. Cheyney, special chairman for the evening, gave an interesting review of the rise of this type of apparatus. He displayed two diagrams, one showing the construction of a typical unit heater and the other a factory installation consisting of four unit heaters. He gave some interesting data regarding the efficiencies of these heaters under varying conditions. A general discussion followed Mr. Frank's address which showed a keen interest in the subject.



FLOOR TYPE OF UNIT HEATER DESCRIBED BY MR. FRANK.

The January meeting of the chapter, which will be in charge of a committee consisting of H. R. Linn, chairman, and E. F. Capron, J. A. Cutler and J. E. Truitt, will be devoted to a discussion of "Heated by Forced Hot Water."



DISTRIBUTION OF HEAT WITH TYPICAL ARRANGEMENT OF UNIT HEATERS.

The fourteen new members of the chapter are W. J. Gemeny, George D. Luce, Jr., Carl A. Nulsen, J. T. McGann, Edwin S. Storm, W. J. Mauer, A. D. Alexander, Edgar L. Drinkwater, Ira N. Soper, William E. Foskett, G. H. Blanding, W. E. Mertz, F. E. Black and Roy M. Getschow.

Eastern Pennsylvania Chapter.

Speaking of the subject of "Mechanical Stokers," at the November meeting of the Eastern Pennsylvania Chapter, held at the Engineers' Club, Philadelphia, November 13, H. F. Lawrence addressed one of the largest meetings the chapter has held since its organization. Mr. Lawrence went extensively into the subject of firing boilers, starting with hand-firing and proceeding through the various stages of stoker development up to the point of the very high efficiency achieved by the modern type of mechanical stoker. He also discussed the subject of coal analysis, giving valuable suggestions for selecting the right kind of coal for various conditions and describing fully the operating characteristics of overfeed and underfeed stokers. He also went into the subject of forced and induced draft fan equipment.

Vapor Heating Discussed by the Michigan Chapter.

"Methods of Vapor Circulation for Heating Purposes" was the subject for discussion at the November meeting of the Michigan Chapter. The subject was introduced by J. E. MacDonald, who is now a resident of Detroit through his connection with the Coon-DeVisser Company, of that city.

Mr. MacDonald, who is a pioneer in the vapor heating field, told of the difficulties encountered in the development of this type of heating system. He pointed out the methods that have been found successful in overcoming the defects of the early systems and explained the present-day methods of venting the air and returning the condensation to the boiler.

The speaker laid stress upon the importance of good engineering in making the piping layout if uniform results are to be secured in all types of buildings. A spirited discussion followed the presentation of the paper.

A publicity committee was appointed by President W. F. Verner, consisting of C. R. Ammerman, J. E. Degan and C. M. McSorley. A membership and research fund committee were also appointed consisting of J. R. McColl, E. E. McNair and F. R. Still.

The subject of the December meeting which was held December 8, at the Board of Commerce, was "Manufactured Weather," which was presented by J. E. Bolling, of New York, and illustrated by lantern slides showing various applications of methods and apparatus for air conditioning work.

Kansas City Chapter Takes Up Fuel Conservation Devices.

A live subject was offered at the November meeting of the Kansas City Chapter when the members discussed "Improved Devices for Conserving Fuel." President F. A. Sheppard presented a paper covering automatic temperature and humidity control, and stokers. He stated that the largest factor in fuel conservation was the proper education of the fireman or engineer. The latest improvements in temperature control systems of the pneumatic type, he said, is the reduction in size and improved appearance of the thermostats. These can now be arbitrarily shut off and they also have an indicator to show the position of the valves. The metallic diaphragm, he added, is the greatest recent improvement in the action of the device. Humidity control, he said, is not so well developed and still shows room for improvement.

He divided stokers into three classes: overfeed, sidefeed and underfeed. Almost any of these will show fuel economies of from 10% to 20% over the hand-firing of furnaces.

Ben Natkin, the next speaker, read a paper on vacuum steam heating improvements. The greatest improvement along this line, he stated, is the thermostatic radiator trap. He referred to tests now being conducted on such a trap with a metallic diaphragm. Improvements in vacuum pumps, he said, are shown in the use of electric motors and in the new types of pumps in which the water and air are handled in the most economical way.

Mr. Natkin called attention to the large waste of heat through the ordinary roof construction where there is no ceiling and which is better known as "bare roof" construction. He stated that the amount of radiation must be almost doubled to take care of these losses. The saving in cost of the building, he showed, is more than counterbalanced by the cost of radiation and of operating the system.

R. L. Dunlap followed with a discussion of furnaces for large installation, the efficiencies of which, he said, have been increased 20% in the last ten years.

During the business session B. F. Cooke and W. D. Reed were elected to membership in the chapter.

A program and publicity committee were appointed, consisting of F. A. Griffin, J. G. Pease and J. H. Kitchen. A membership committee was also appointed, consisting of Martin Hauser, L. W.

Millis, R. W. Hillman, W. W. Howe and W. E. Gillham.

Ohio Chapter.

The principal topic for discussion at the December meeting of the Ohio Chapter, held December 11 at the Hotel Statler, Cleveland, was "Utilization of Sprinkler System Piping for a Heating System." The topic was presented by A. W. Moulder, chief engineer of the General Fire Extinguisher Co., Warren, O.

St. Louis Chapter Elects Officers.

The following officers were elected at the annual meeting of the St. Louis Chapter: President, E. S. Hallett; vice-presidents, E. P. Bradley and L. Walter Moon; treasurer, H. C. Tabler, and secretary, Walter Klein.

Meeting of British Heating Engineers.

At the general meeting of the Institution of Heating and Ventilating Engineers, at University College, London, November 14th, Walter W. Nobbs, senior vice-president of the institution, was elected president for the year 1920.

The technical session was taken up largely with a discussion of the paper presented by Mr. Nobbs at the summer meeting on "Air Interchange and Heat Loss from Buildings."

A. H. Barker told of the progress being made in the experimental tests of the heat transmission at University College of the heat transmission through various building materials. He said the Bath Stone Company had been asked to supply a limestone wall for testing heat transmission through stone walls and this company promised to supply two kinds, Portland and Bath stone, and to erect same in the institution's laboratory. The stone being supplied is that most commonly used in England.

Mr. Barker also announced that some improvements had been made in the testing apparatus, Mr. Kinoshita having devised a method of regulating the electric current so as to obtain it at a constant voltage which, it was found, is very necessary for laboratory work.

Extended experiments have been made on radiators and a particular gilled radiator has been found to follow the data laid down in Mr. Kinoshita's paper (see THE HEATING AND VENTILATING MAGAZINE for December, 1918). Experiments are also being made on air passing over a radiator to discover the increased transmission due to this. The results of these tests will be published as soon as completed.

Several boilers have been tested, but the results are not yet available on account of the high cost of printing.

The Department of Scientific and Industrial Research of the University of London originally divided the testing of heat transmission into two sections, i. e., thin and thick materials. The thick materials, which are the most difficult to test, were allocated to the British Institution of Heating and Ventilating Engineers, and the thin materials to the National Physical Laboratory. An endeavor is now being made to arrange for the testing of thin materials by the institution's Research Committee. It was brought out that the work of the Research Committee is considerably hampered through the lack of sufficient funds.

Announcement was made that Mr. Kinoshita, who has been closely connected with the experimental work at University College, would give a course of lectures on the general principles of heating and ventilation and, if support were accorded, would give a second series at the opening of the year on "The Physics of Heating and Ventilating."

The next meeting of the institution is scheduled for February 10 at Holborn Restaurant, London.

Heating Tunnel for Iowa State Capitol.

The accompanying illustration gives a good idea of the method followed in constructing the tunnel from the power house to the State Capitol in Des Moines, Ia. This tunnel, which was built by Thos. Carey & Sons, of Des Moines, is for use primarily for conducting the heating pipes to the State buildings from the new power plant built on the south side of Capitol Hill.

The length of the tunnel is 3100 ft. and in cross section it is 9 ft. 6 in. in height and 3 ft. in width, inside measurement. It is of reinforced concrete construction. The floor is 12 in. thick, the side walls 9 in. and the top slab 9½ in. The construction was carried forward in 50-ft. sections, each section monolithic.

50-FT. SECTION OF TUNNEL READY FOR CONCRETE, IOWA STATE CAPITOL PLANT.

After the concrete was sufficiently dry, the entire surface of the two side walls and the top slab were covered with a 3-ply waterproofing membrane, consisting of three sheets of asphalt-saturated felt and four applications of bituminous paint in alternate layers. Drainage along the tunnel is provided on one side by a 6-in. open tile line and on the other by a 10-in. open tile line, covered with gravel and crushed stone.

The excavation ranged from 12 ft. to 22 ft. in depth, and the width of the cut is carried 18 ft. at the top to approximately 14 ft. at the bottom.

The tunnel is to be used for transportation purposes, as well as for conducting the pipe lines. Electric warehouse trucks are to be operated in the tunnel from the power plant and store rooms to the various buildings located on the Capitol grounds.

New Publications.

NINTH ANNUAL REPORT BY THE DIRECTOR OF THE BUREAU OF MINES for 1919 tells, among other things of the work of the Fuels and Mechanical Equipment Division at Pittsburgh, under the supervision of O. P. Hood, chief mechanical engineer. Outside of the general fuel investigation, the division made tests on the use of powdered coal and tests of coke for house-heating purposes; also heat transmission into steam boilers, and combustion tests of coal. The Division of Petroleum Technology made numerous investigations which are now of especial interest to heating engineers in view of the growing use of fuel-oil as a substitute fuel for coal.

Particular mention is made of the co-operative arrangement made with the American Society of Heating and Ventilating Engineers "to conduct joint research work at the Pittsburgh laboratories of the Bureau of Mines on matters pertaining to the efficient use of fuels."

In connection with the use of coke for house heating purposes it is stated that tests have been started to determine the best method of burning domestic-size coke in the heating apparatus now used in dwellings. Tests will be made in steam boilers of several makes, in hot-air furnaces, heating stoves, and open grates—comparative tests being run with coke, anthracite coal, and high-volatile bituminous coal. Another series of tests will be made to determine the principles governing the design of apparatus for burning coke. Part of the work will be done at the Minneapolis station. The object of the heat transmission investigation, it is stated, is to determine the effect of the various factors governing the transfer of heat from the hot furnace gases into the water of a steam boiler. The plant for the work, consisting of a tubular boiler 20 ft. long and a gas furnace, is being rebuilt, with some modifications, in the new fuels-testing laboratory at the Pittsburgh station.

ECONOMY IN USE OF FUEL OIL.

Various problems of oil-fuel economies were investigated for the western division of the Fuel Administration. A number of fuel-saving devices were examined, such as burners, carbureter attachments, gauges for small oil tanks, and gas radiators. Twenty-five boiler plants about San Francisco Bay, and 226 power plants in California using fuel oil were inspected and recommendations made that effected a saving of 5% to 25% at each plant. A handbook entitled "Efficiency in the Use of Oil Fuel," by Mr. Wadsworth, was published for the use of boiler plant and locomotive engineers intimately associated with the use of fuel oil. A revised edition is in press.

THIRD ANNUAL REPORT OF THE UNITED STATES COUNCIL OF NATIONAL DEFENSE for 1919, has an interesting section on its reconstruction activities which include its reconstruction and readjustment information service which has been available to the leaders of private enterprise just as it was made responsive to the needs of governmental agencies. One of the most useful publications of the Council is its "Daily Digest of Reconstruction News" which was started November 12, 1918.

One hundred and eleven local committes of the council have been at work on the housing problem in 24 states and 65 homes registration services were in operation which have helped greatly to relieve congested housing conditions in crowded centers of war industry. The Council's Committee of Reconstruction Problems, Vernon Kellogg, chairman, contemplates a report having to do with reconstruction both at home and abroad.

Professional Engineers Must Be Registered in Oregon.

The Oregon State Board of Engineering Examiners is now fully organized and prepared to receive applications for registration of the professional engineers in Oregon, and others who expect to practice engineering in that state.

Under the provisions of this law it is necessary for all civil, mechanical, electrical, mining, chemical and all branches of professional engineering to register. The law went into effect January 1, 1920.

Need of Better Facilities for Making Long-Term Loans for Construction Purposes.

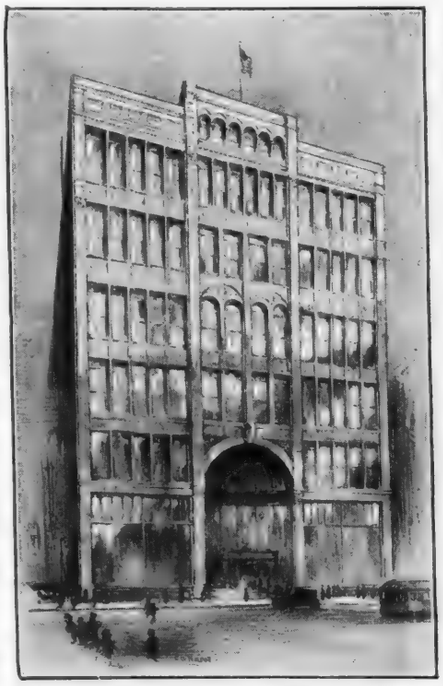
In a memorial addressed to Congress by the National Federation of Construction Industries urging an improvement of conditions for making long-term loans for construction purposes, it is stated that the preference created by the Federal Reserve law for the investment of capital in commercial discounts and other like forms of investment has resulted in withdrawing large sums of money from availability for loans on building and real estate, and has thus greatly hindered the construction industry and increased the difficulty attendant upon the restoration of normal conditions in the construction industry.

The recommendation of the federation is that a Congress committee take up the matter, with a view of developing a modern system of long-term banking, complementing, but not conflicting with, the Federal Reserve system "so that the nation's wealth may be more completely mobilized both for times of peace and for times of emergency, and so that national development may be promoted during the period of reconstruction."

The federation went on record as endorsing the Calder bill in the Senate entitled, "A Bill to Encourage the Building of Homes by Providing for Exemption from Taxation of the Income from Mortgages on Real Estate."

New Type of Buying Center in Buffalo, N. Y.

A new buying center has been established in Buffalo, N. Y., designed to serve as a central market where manufacturer and buyer may be brought together for mutual benefit and profit. It is known as the Associated Service Building. This method of centralizing the complete lines of hundreds of manufacturers under one roof makes the building practically a wholesale buyers' department store where everything from heaters to automobiles are on display and sold.



ASSOCIATED SERVICE BUILDING, BUFFALO, N. Y.

In connection with the building a buyers' club has been formed. Any buyer of any kind of merchandise is eligible to membership. There are no dues, the club being purely a service organization. A handsome club room is provided where the service includes public stenographers, telephone service, etc. Here the products displayed in the building are indexed as well as catalogued in the "buyers' offering books" which contain an announcement by each manufacturer of his seasonable offerings and a short description of his line of goods. The room also contains large catalogue and literature display racks and dealers' keep displays where each manufacturers' story of his product is told in detail.

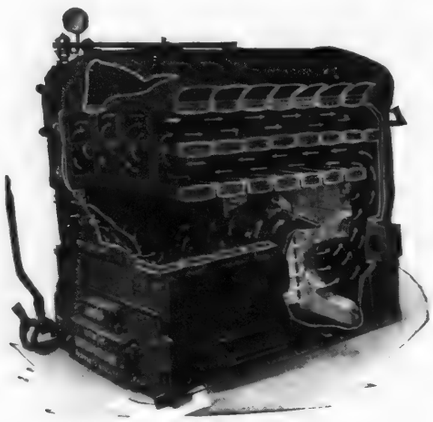
The service is also described as being especially valuable to anyone interested

in looking over a variety of products with the minimum expenditure of time and trouble.

New Type of Smokeless Boiler.

A smokeless boiler containing new and interesting features, has recently been placed on the market by the International Heater Co., Utica, N. Y., under the name of the Economy smokeless boiler. In a bulletin devoted to this new product it is explained how the three essential factors of temperature for the complete combustion of the volatile and smoke-producing gases of soft coal, namely, temperature, mixture and time, are developed and applied in this design. The modern idea of burning soft coal smokelessly and economically by stewing or gradually liberating the gases at a relatively low temperature in the firebox and burning them at a high temperature in the primary and secondary combustion chambers to the rear of the firebox, is fully explained.

According to government bulletins, it is estimated that about 40% of the fuel waste of the country is due to excess air passing through boilers. The importance of controlling this wasteful excess air factor and the way it is controlled in the Economy smokeless boiler are set forth at length. The absence of special grates or special arches in the firebox, it is stated, simplifies the method of firing to such an extent that the boiler may be fired like the common type of flat grate up-draft heater. This feature alone is considered one of the boiler's most important claims for attention. The advantages and disadvantages of the three principal methods of firing soft coal, the coking method, alternate method and center method, are pointed out and illustrated. Considerable space, also, is devoted to the firing of soft coal and why all methods are not suited to all kinds of soft coal or to different boilers.



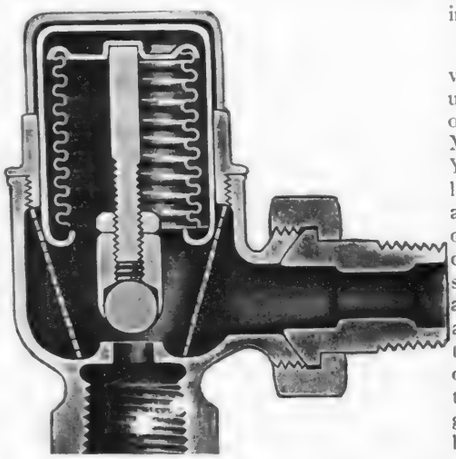
ECONOMY SMOKELESS BOILER, A NEW TYPE.

The Economy smokeless boiler is rated no higher than the corresponding hard-coal boiler for the corresponding size, although exhaustive tests, it is stated, would warrant a 10% to 25% higher rating, as is the general practice. For conservative reasons, however, because of the great variation in the quality of different soft coals, the hard coal ratings have been maintained.

The bulletin points out in condensed form sixteen special features of the Economy smokeless design, such as that just mentioned of holding down the ratings to the hard coal basis, as well as this boiler's ability to deliver dry steam without an expensive header, its large coal-carrying capacity, and the fact that no special kind of coal or method of firing is required. A copy of the bulletin on this new boiler may be had by addressing the company.

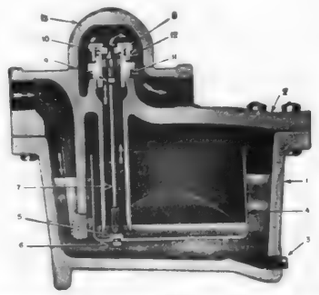
Trade Literature.

SARCO RADIATOR TRAP, a new type recently developed by the Sarco Co., New York, is featured in circular matter showing its unique construction. The diaphragm is spirally corrugated and is described as of great strength. The most interesting feature, however, is the valve head which is a ball, freely turning in a socket. A large strainer is provided to protect the valve opening. The trap is described as suitable for use on vacuum heating work and for any pressure up to 20 lbs. It is made in 3/8-in., 1/2-in. and 3/4-in. sizes.



CONSTRUCTION OF SARCO RADIATOR TRAP.

MCALEAR SPECIALTIES for all steam heating and power plants, which are brought to the attention of the trade in a recently-issued catalogue, (No. 25), include several types of steam traps, such as the Universal high and low-pressure steam traps, Universal extra-heavy steam traps and Special Vento coil steam traps. The extra-heavy type is shown in the accompanying illustration and is suitable for pressures up to 250 lbs. in draining extra-high steam pressures, such as steam separators, boiler headers, pipe lines, etc., without the loss of steam through the trap discharge. It is of the open bucket, non-collapsible, hinged float type and is provided with a water seal to insure the tight closing of the valves. All of these traps have the latest feature as to accessibility of the wearing parts by unscrewing two nuts and removing the cap. The seats are reversible and along with the discs can be replaced in a few minutes with a minimum of cost. The bodies and covers are of grey cast-iron and the seats and discs of nickel or monel metal, although for extreme high pressures the company furnishes bodies and covers of cast-steel. The extra-heavy trap, which is manufactured by the McAlear Mfg. Co., Chicago, Ill., is furnished in eight sizes, running from 1/2-in. to 3-in.



UNIVERSAL EXTRA-HEAVY STEAM TRAP.

ECONOMY ASH SIFTER, a newly-invented device that operates without the usual shaking movement, has been placed on the market by the Vulcan Sheet Metal & Mfg. Co., 45 Fulton St., New York, and is described in a recent circular. The sifter is 72 in. long, 17 in. wide and 56 in. high. It weighs 80 lbs. All objectionable features, it is stated, are done away with, such as turning a crank, shaking, etc. As will be noted from the accompanying illustration, the action is accomplished by gravity. The ashes from the heater are shoveled into the hopper of the sifter and the sifting is done as they slide down over the surface of the galvanized wire cloth. The waste ash bin holds two barrels so that the siftings do not need to be removed until that amount of accumulation is reached. An opening to the clean cinder bin enables the cinders to be shoveled out as required for the heater. The sifter is listed at $18.50 net.

ECONOMY ASH SIFTER.

Meet the new standards of Heating with IDEAL TYPE "A" BOILERS

An Attractive, Compact Battery Installation

IDEAL TYPE "A" BOILER with Integral Insulated Metallic Jacket for Steam, Vapor, and Hot Water Heating. The compactness and low water line features of the IDEAL Type "A" Sectional Boilers make a head-free, airy, and attractive boiler room.

Converts the cellar into a cheerful, livable addition to the ideal home. Used for heating cottages, mansions, apartments, hotels, schools, courthouses, stores, churches, depots, theaters, banks, hospitals, institutions, and other buildings.

Send today for complete illustrated catalog giving efficiency charts, range of sizes, and remarkable heat control features.

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Sales branches and showrooms in all the large cities

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The Moline System.

A typical layout of the Moline system is shown in Fig. 1. It is a two-pipe arrangement, the steam line carrying the steam or vapor from the boilers to the radiators and the return line carrying the air and condensation from the radiators back to the boiler. At that point the water enters the boiler and the air is drawn into the ejector fitting (Fig. 4) which discharges a mixture of air and steam into the condenser. Here the steam is condensed, the water finding its way back to the boiler by way of the condenser drip (through a check valve, along with the condensation from the return line) the air going out of the system through the special air trap and vacuum valve (Fig. 5).

An innovation in this system is the use of a lock-shield globe valve on the return end of each radiator and another is the use of the ejector fitting to produce a pull on the return lines of greater intensity than can be secured by simply opening the return line to

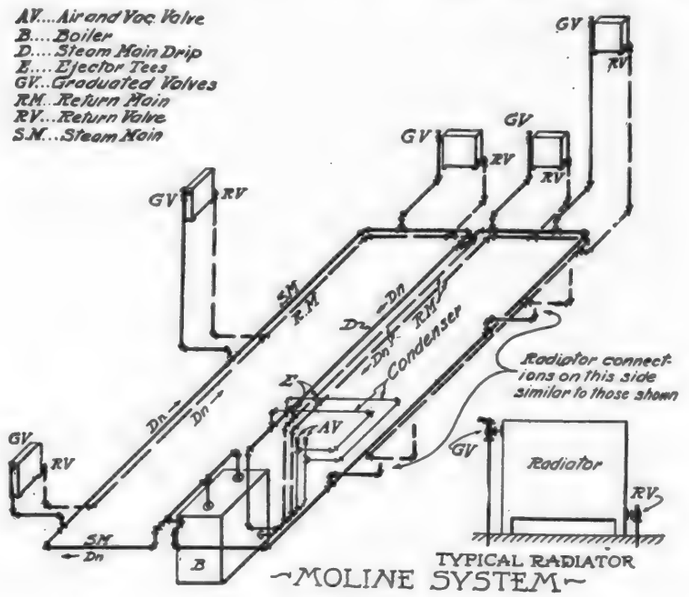


FIG. 1.

the atmosphere or even by connecting the air-vent line to the chimney and employing the chimney draft.

In the radiator supply valve (Fig. 2) a slotted sleeve is placed around the disc so that the disc will open these slots or ports gradually as it rises past the openings. The number of slots in the sleeve determines the quantity of steam which will flow for a given rise of the disc and the sleeves are arranged and sized to suit any size of radiator.

The radiator return valves (Fig. 3) are all ½-in. and are of the lock-shield type. They are also provided with an interior sleeve, having small perforations, which allows the water and air to pass without permitting the loss of an undue amount of steam. They are adjustable to suit any condition of service.

The illustration of the ejector (Fig. 4) indicates how the steam or air under pressure in the steam line blows out through the nozzle of the ejector fitting, creating by its velocity, a suction around the jet, this suction drawing out the air from the return lines and discharging the mixture into the condenser. Connecting this ejector near the point where the steam main drops down under the water-line takes the place of an air valve at this point. The steam used to operate this device is condensed in the condenser coil and there gives up its heat. By placing the condenser coil in the basement this serves to heat that part of the building.

(*Continued on Data Sheet No.* 132-H.)

VAPOR HEATING—The Moline System. No. 132-G.

VAPOR HEATING.

The Moline System.

(*Continued from Data Sheet No.* 132-G.)

FIG. 2.

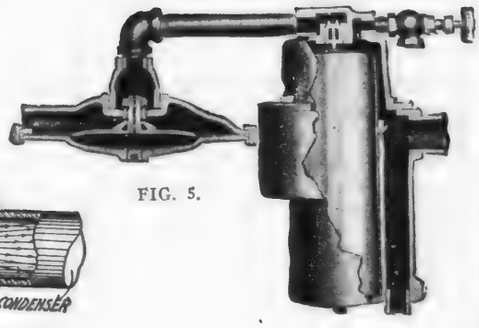


FIG. 5.

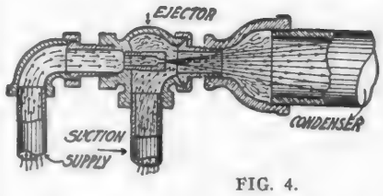


FIG. 4.

The operation of the air trap (Fig. 5) is that of an enormous vent valve and is accomplished by the expansion and contraction of the air contained in a float with an open bottom. No expansion post or volatile liquid is used in this trap. The trap allows the air to discharge into the pipe shown, on which is placed a vacuum valve. The function of this valve is to close off and prevent the return of air into the system whenever the pressure falls below that of the atmosphere.

In sizing the piping for this system the schedule shown in Table I may be used if the length of the mains does not exceed 100 ft. Each elbow should be counted as 10 ft. additional run.

No horizontal supply branch is reduced to less than 1 in. and no horizontal return branch to less than ¾-in., while all supply mains are made 2 in. or over. The sizes of risers are ordinarily made at least one size larger than the radiator valve and, if there are turns in the line, they are made two sizes larger, the increase being made immediately below the radiator valve.

TABLE 1.

Equivalent Direct Radiation Sq. Ft.	Steam Supply In. Diam.	Dry Air and Water Return, In. Diam.	Wet Return. In. Diam.
450	2	1	1¼
750	2½	1¼	1¼
1,350	3	1½	1½
2,000	3½	2	2
2,700	4	2	2
3,600	4½	....	2
4,700	5	....	2
7,500	6	....	2½
11,000	7	....	2½
15,600	8	....	3
21,000	9	....	3
28,000	10	....	4
44,500	12	....	4

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

BELTING.

To find the length of belt wanted: Rule 1. Add the diameter of both pulleys together, divide by 2, and multiply quotient by 3 1/8; add this product to twice the distance in inches between the center of shafts, and the final sum will be the length required. Example. Diameter of large pulley 24 in. + 12, (diameter of small pulley) = 36 ÷ 2 = 18 × 3 1/4 = 58 1/2 × 216 (twice distance between shafts) = 274 1/2 in. length required.

To find width of belt required for a given horse-power: Rule 2. Multiply the horse-power by the constant 2,750, then multiply the diameter of driven pulley by the number of revolutions and divide the first product by the latter. The quotient will be the width of belt required. Example 2. Horse-power 28 × constant 2,750 = 77,000; diameter of pulley 36-in. × revolutions 200 = 7,200; 77,000 ÷ 7,200 = 10 in., width required.

To find the horse-power which a belt will transmit. Rule 3. Multiply the width of belt by diameter of driven pulley in inches. Multiply this product by revolutions of pulley per minute, then divide final product by constant 2,750. The quotient will be the horse-power. Example 3. Belt 10 in. × 36 (diameter of pulley) = 360 × 200 revolutions = 72,000 ÷ 2,750 constant = 26.5 H. P. required.

The horse-power and width of belt given, to find the diameter of driven pulley required. Rule 4. Multiply the horse-power by constant 2,750, now multiply revolutions of pulley by the width of belt, then divide the first product by the latter. The quotient will be the diameter wanted. Example 4. Horse-power 28 × 2,750 = 77,000; revolutions 200 × 10 = 2,000; 77,000 ÷ 2,000 = 385 diameter wanted.

The horse-power, diameter of pulley and width of belt given, to find the number of revolutions of driven pulley. Rule 5. Multiply the horse-power by 2,750, now multiply the diameter of pulley by the width of belt, and then divide the first product by the latter. Example 5. Horse-power 28 × 2,750 = 77,000; diameter 36 × 10 width = 360; 77,000 ÷ 360 = 211.4 revolutions wanted.

DRIVES, BELT—Rules for Computing. No. 168-B.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

BELTING.

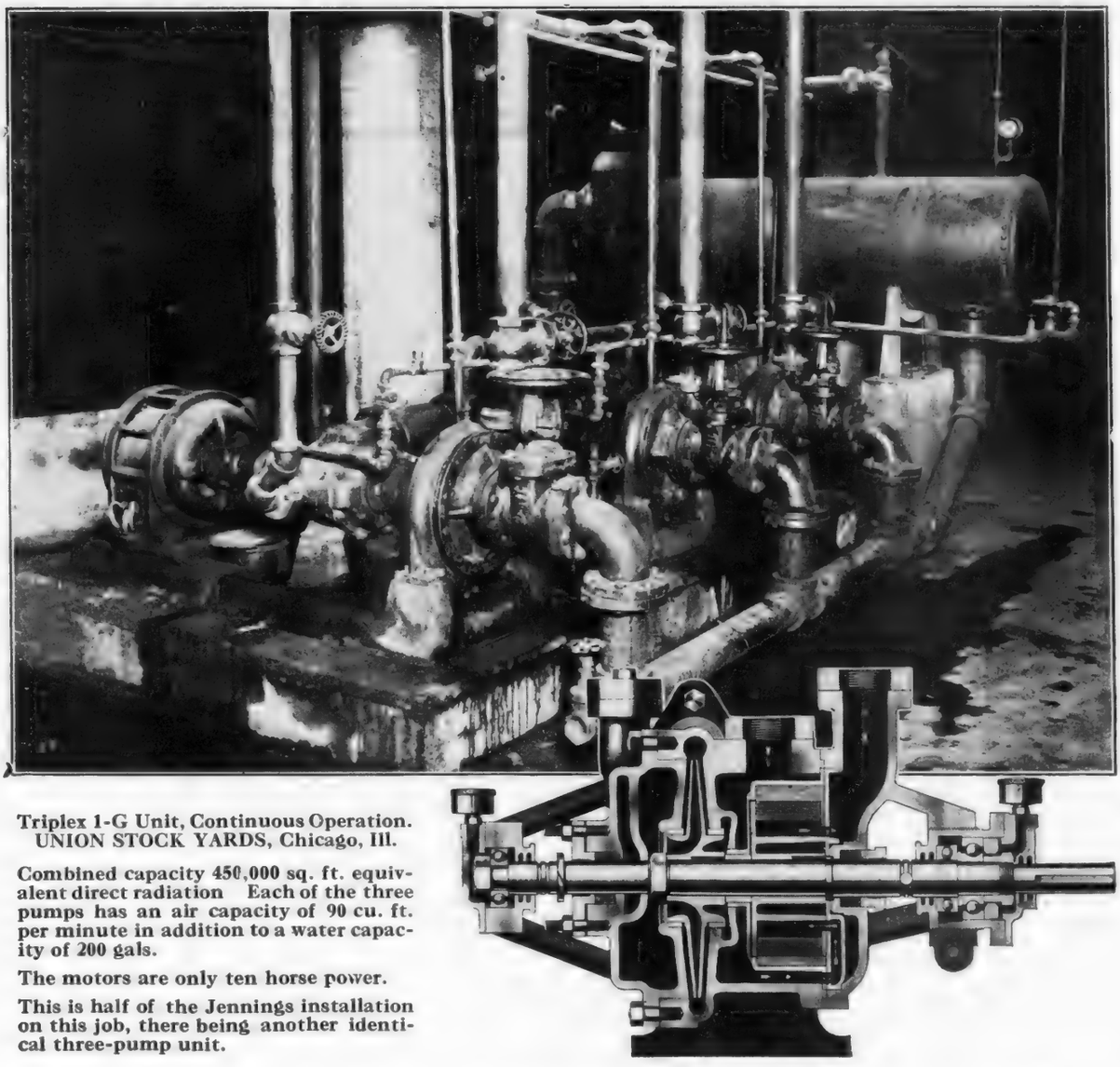
Table of Belt Contacts.

Degrees of Contact		Fraction of Contact		Decimal Fraction of Circumference	Ratio	Constant. Single Belt	Constant. Double Belt
90	or	1/4	=	0.25	2.21	6080	4250
112	or	5/16	=	.312	1.72	4730	3310
120	or	1/3	=	.333	1.6	4400	3080
135	or	3/8	=	.375	1.4	3850	2700
150	or	5/12	=	.417	1.24	3410	2390
165	or	7/16	=	.437	1.17	3220	2250
180	or	1/2	=	.500	1	2750	1925

For all practical purposes, the arc of contact of belt on smaller pulley can be roughly estimated by comparison with figures in first column in table above. For example, take the arc of contact 150° and compare it with your belt. If it agrees approximately, then taking Rule 3 we have Example 3 (Standard Data Sheet No. 168-B, modified as follows: Belt $10 \times 36 = 360 \times 200 = 72{,}000$. By new constant $3{,}410 = 21.1$ H. P., or a loss of 5.4 H. P. as compared with full contact or half circumference in Example 3.

To find length of belt when closely rolled. Add the diameter of the roll in inches to the diameter of the eye, multiply this by the number of turns. This result multiplied by the decimal, 0.1309 will give the length of roll in feet.

EFFICIENT HEATING
demands the Jennings Pump



Triplex 1-G Unit, Continuous Operation.
UNION STOCK YARDS, Chicago, Ill.

Combined capacity 450,000 sq. ft. equivalent direct radiation Each of the three pumps has an air capacity of 90 cu. ft. per minute in addition to a water capacity of 200 gals.

The motors are only ten horse power.

This is half of the Jennings installation on this job, there being another identical three-pump unit.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately, four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY
SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

CHICAGO, ILL.—A number of Chicago's vaudeville and moving picture theatres are now heated and cooled by air from the city's freight tunnel. Vents have been cut into the tunnel from the Rialto, McVicker's Randolph, Orpheum, Bijou Dream and Lyric Theatres, and fans installed which draw the air from the tunnel through a water filter. It is stated that the temperature of the air varies only two or three degrees in either cold or warm weather. Jones, Linick & Schaefer, operators of the theatres, report that they have succeeded in cutting their coal quota 80% as a result of the changes. At the present time these theatres are using only coal enough to heat the lobbies and dressing-rooms.

PEORIA, ILL.—As the result of an inspection of the heating and ventilating system for the Peoria High School to discover the cause of unsatisfactory operation, it was found that the small motors in the warm air duct which open and close the dampers at the end of the duct at certain times, were out of order so that the air coming from the duct approximated the temperature of the outdoors. The inspection was made by Frank Nelson, chairman of the building committee of the board of school inspectors, and Scott Perdue, a heating engineer. The inspection was made by crawling through the duct under parctically the entire building, and as the duct is but 2½ ft. in height, it resulted in an experience that is still the talk of the board.

CHICAGO, ILL.—Professor A. C. Willard, head of the Department of Heating and Ventilation at the University of Illinois, is the author of the following "seven rules" which, he states, should be heeded by every user of fuel:

Heating surfaces should be kept clean and free from soot and ash accumulations, and the entire ash pit should be cleaned daily.

Grates should be true, and not warped, should move easily, and should have no broken places for coal to drop through. Unburned or partly burned coal should not appear in the ashes.

The fuel pot should be kept full, with fire surface at the level of fire door; let ashes accumulate on (not under) the grate in mild weather. Grates should not be shaken too long or violently, and clinkers should be removed with as little disturbance of the fire as possible. Do not shake or disturb a very low fire until you have added and ignited a little fresh fuel.

If the heater is small for its work, do not use coal containing a large amount of fine material.

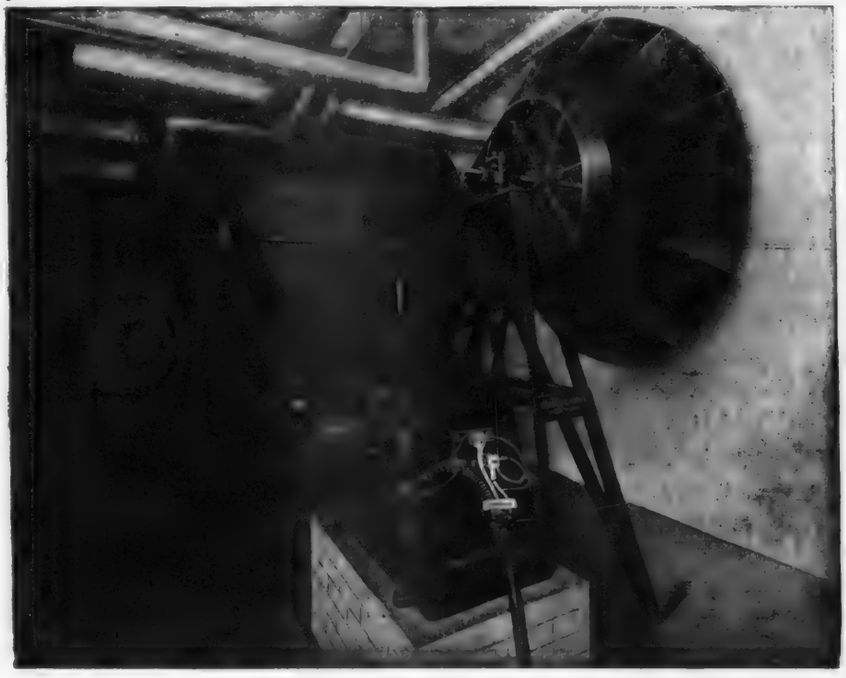
The house should be kept at a uniform temperature and not allowed to cool down more than 10 degrees at night.

CHICAGO, ILL.—Although 60% of the prosecutions brought under the general police powers to compel adequate heat in homes have resulted in convictions, Health Commissioner Robertson has asked for a specific ordinance on the subject. A minimum fine is proposed of $25.00 and a maximum fine of $200.00 for owners, agents or managers convicted of furnishing inadequate heat,

HOWARD & MORSE

45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS



MANUFACTURERS OF

Blackman

AND

Duplex Cone Fans

COMPLETE WITH

Motors, Duct Work and Wiring

Aligning, Rigging, Hoisting

GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

SEND FOR CATALOGUE.

light or ventilation. Fifty-one complaints of insufficient heat were received in one day recently.

KANSAS CITY, MO.—A stir has been created in Kansas City through the awarding of a heating contract for the water department station in that city to C. E. Thompson. Mr. Thompson is not a member of the local master plumbers' association and although his bid was the lowest by some $500.00, the holding up of the contract has led to charges that there is a combine to control the award of city heating and plumbing contracts. A statement that the other bids were padded has led to a general investigation by the finance committee of the city council. Meanwhile the executive committee of the "independent" plumbers' organization has adopted resolutions to stand behind Thompson in the controversy. The contract amounts to $7,498.

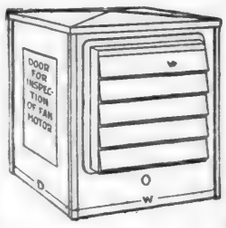
JOHN C. F. TRACHSEL, Philadelphia, Pa., the veteran heating and ventilating engineer and contractor, and for many years sergeant-at-arms at conventions of the National Association of Master Steam and Hot Water Fitters, celebrated his 75th birthday anniversary recently when he was presented with a purse from his associates in that organization. He was also the recipient of a host of messages of good will and greetings from his many friends in Philadelphia and elsewhere.

BUILDING TRADES EMPLOYERS' ASSOCIATION OF PHILADELPHIA and vicinity has now effected permanent organization. One of the objects of the association is to prepare a standard form of contract for the use of its members. The association will also conduct a credit bureau. Dues vary from $1.00 to $25.00 per annum, based upon the volume of business done. The officers elected are: President, William M. Anderson, Wm. M. Anderson Co.; first vice-president, Charles P. Biggin, Chas. P. Biggin Co.; second vice-president, H. G. Kepler, Walker & Kepler; third vice-president,

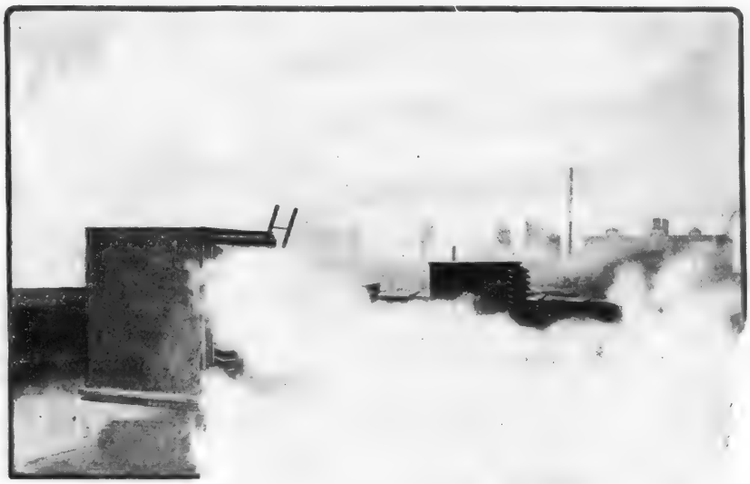
ILG POWER ROOF VENTILATORS

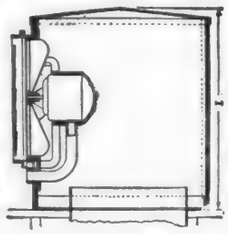
FOR

Buildings where Roof Ventilation Provides the only Practical Means of Exhausting Foul Air, Steam, Smoke, etc.



Ilg Power Roof Ventilator Showing Automatic Shutter





Sectional View Showing Placement of Fan

Fig 1. Showing localizing method of installing Ilg Power Roof Ventilator with vertical duct connected to hood over furnaces, mixing or cooking vats.

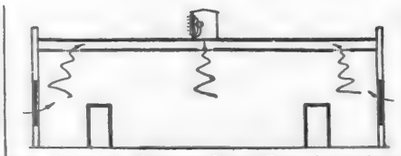


Fig2. Lodge halls, theatres and upper floors of stores, factories, etc., are effectively ventilated by drawing air out through false space between ceiling and roof. Note registers in ceiling.

Fig. 3. One Story Factories, Laundries, Foundries, etc., are economically ventilated by locating Ilg Power Roof Ventilators directly over spots where ventilation is most needed. Fresh air thru windows gives complete circulation.

In sound practice, irrespective of atmospheric conditions, one ILG POWER ROOF VENTILATOR is equal to several ordinary natural gravity ventilators. Where the air to be handled is heavily ladened with steam, moisture, smoke, gases or fumes, the ILG POWER ROOF VENTILATOR is by far the most efficient. The only equipment of the kind with a "Fully enclosed self-cooled motor" driven fan.

WRITE FOR CIRCULAR ILLUSTRATING THIS APPARATUS IN DETAIL

ILG ELECTRIC VENTILATING CO.

158 Whiting Street CHICAGO, ILL.

BRANCHES IN ALL LARGE CITIES

GET IN THE BIG MONEY CLASS NOW

SANITARY HEATING AND VENTILATING ENGINEERING

SANITARY, Heating and Ventilating Engineering offers wonderful opportunities for advancement and money making right now. Modern methods and appliances are fast replacing the old ones, and the men who are up-to-date—the trained men—the men who know—are going to reap the benefit.

Get your share of the big money now. Here is the first thing for you to do—tear the coupon off this page and mail it to us today. It won't obligate you in any way and you don't have to send a penny, but it will bring you these four big volumes—just off the press—packed full of the very things you need to train yourself—all worked out for you in clear, understandable English by eighteen of the most successful men in these professions today.

No matter what your job is or how much you earn, you need these books—and you need them now. If you are in business for yourself, they will make your business bigger and better—the volume on business management, estimating and contracts and specifications alone will do it.

SHIPPED FREE Examine the books and see for yourself just how valuable they are, but don't send us any money. The little coupon is all you need. Fill out all three lines and mail it NOW. It will bring you the whole set of books by express collect, and you can keep them seven days to use as you please—study them at home—take them to your shop—try to find some problem they won't answer, and ship them back at our expense if you think you can get along without them. If you want to keep the books after seven days' use, send us only $2.00. The balance can be sent in monthly payments of $2.00 each until the special introductory price of **$14.80** is paid.

It will take years of hit-or-miss experience to gain what these books will give you in a short time; so don't pass up this opportunity—ACT NOW. We may never be able to offer this low price and these special terms again—only 7 cents a day. Tear the coupon off now before you lay this down and mail *today*.

AMERICAN TECHNICAL SOCIETY
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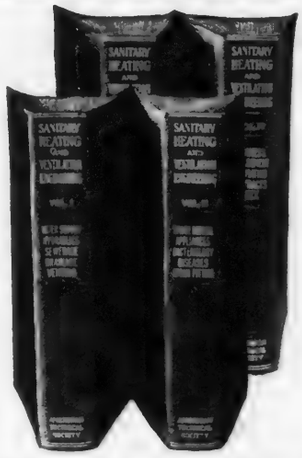

4 big volumes, size 5-1/2 x 8-1/4 inches, bound in flexible American Morocco and trimmed in gold: 1454 pages: over 1100 pictures, diagrams and plates.

HERE'S WHAT THE BOOKS CONTAIN Thousands of problems under the following headings are all worked out and made as simple as A-B-C.

Sanitary Science and Materials.
Water Supply. Hydraulics.
Sewers and Drains.
Drainage and Venting.
Sanitary Appliances. Sewage Disposal.
Bacteriology and Sanitation.
Infectious Diseases.
Steam and Hot Water Fitting.
Domestic Hot Water Supply.
Heating and Ventilating Engineering.
Sheet Metal Work.
Business Management. Estimating.
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General Index and Review Questions and Index to Each Volume.

FREE CONSULTING SERVICE With these books goes free a year's consulting service in the American Technical Society, worth $12.00. This enables you to consult our engineers and experts for one year without charge. Ask as many questions within the scope of the book as you want for one year.

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Please send me the 4-volume Library of Sanitary Heating and Ventilating Engineering for 7 days' Free Examination, shipping charges collect. I will send you $2.00 in 7 days and $2.00 each month until the special price of $14.80 is paid, and you will send me a receipt showing the books are mine. If I decide not to buy I will return the books in 7 days.

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J. F. Buchanan, J. F. Buchanan & Co.; fourth vice-president, George W. Bridgman Bridgman Bros. Co.; fifth vice-president, Edward Atkins, treasurer, George F. Curwen, Wm. M. Lloyd Co. The board of directors includes the above-named officers and Edward Lupton, David Lupton Sons, Co.; W. A. Bland. American Radiator Co.; F. F. Turner, Keasbey & Mattison Co.; C. Albert Kuehnle, C. Albert Kuehnle, Inc.; S. A. Jellett, S. A. Jellett Co.; Henry B. Coles, C. B. Coles & Sons Co.; John L. Moyer, Philadlephia Steam Heating Co.; Benjamin Foster, Benjamin Foster Co., and W. H. Doering, J S. Thorn Co.

The association's membership already represents 21 branches of construction and 15 branches of material manufacturing.

NATIONAL RESEARCH COUNCIL, the Engineering Foundation and the Engineering Experiment Station of the University of Illinois, are starting an ivestigation of fatigue phenomena in metals under repeated stress. A special laboratory has been fitted up at the University of Illinois for making the tests and $15.000 a year for two years has been provided by the Engineering Foundation for carrying on the work.

H. ABDULLAH, Cairo, Egypt, inspector of disinfecting apparatus for the Cairo Department of Public Health, desires to receive manufacturers' catalogues of disinfecting apparatus. He also desires to know "where to obtain an instrument for testing the machine, such an instrument to be placed in the midst of the article to be disinfected and which will ring a bell when the temperature reaches the boiling point." Data will also be acceptable on recording thermometers to record the temperatures inside the machine during the process of disinfection.

NEW YORK.—The agreement entered into by the employers and employees in the building trade in New York City and vicinity, is expected to insure peace in the industry for at least the next two years. No ess than 150,000 employees are represented in the agreement, which calls for a working week of 44 hours. The wages to be paid during the two years commencing January 1, 1920, are as follows for a day of eight hours:

Asbestos workers and insulators	$8.00
Art glass workers	7.00
Carpenters	8.00
Cement and concrete workers	
Composition roofers and waterproofers,	$7.00 and 7.50
Dock builders	7.50
Electrical workers	8.00
Electrical workers' helpers	4.50
Eevators constructors	8.00
Elevator constructors' helpers	6.00
Granite cutters	
Hoisting engineers (weekly $46.50) broken time	9.00
Hoisting engineers on combination machine	16.00
House shorers and sheathpilers	7.50
Housesmiths and bridgemen	8.00
Housesmiths' finishers	8.00
Housesmiths' helpers	6.00
Marble carvers (April 1, 1920)	9.00
Marble cutters and setters (April 1, 1920)	8.0
Marble polishers, bed rubbers and sawyers (April 1, 1920)	7.50
Marble cutters' helpers	6.00
Mosaic and terrazzo workers	7.00
Mosaic and terrazzo workers' helpers	
Painters and decorators	8.00
Paperhangers	
Plasterers	8.50
Plasterers' helpers	6.00
Plumbers and gas fitters	8.00
Roofers and sheet metal workers	8.00
Sign painters, letterers and stripers	
Steam and hot water fitters	8.00
Steam and hot water fitters' helpers	6.00
Tile layers	8.00
Tile layers' helpers	6.00
Upholsterers	9.25

The agreement concerning strikes reads:

"The unions as a whole, or as a single union, shall not order any strike against a member of the Building Trades Employers' Association, neither shall any number of union men leave the work of a member of the Building Trades Empoyers' Association, nor shall any member of the Building Trades Employers' Association lock out his employees; and,

"AFCO" FLOOR INLET

For use under Seats in Theatres, Halls, etc.

Volume adjustable from above.

Speed of air current automatically reduced.

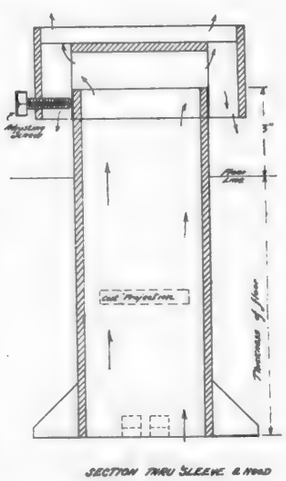
Made of Cast-Iron—Indestructible.

Provides an even distribution of air in all directions.

Adjustable sliding top regulates exactly the area of opening, yet maintains a uniform distribution without drafts. Sanitary, supply pipe always covered.

The illustration shows cast-iron sleeve about 12 in. long for insertion in concrete. Note lugs for nailing to the floors.

For wooden floors, we have a sleeve 3 in. long, with flange for screws.



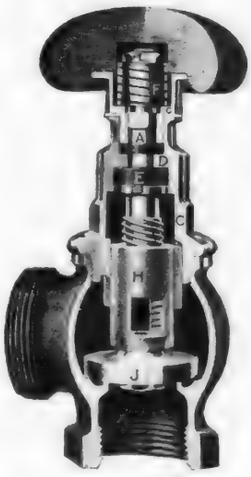
SECTION THRU SLEEVE & HEAD

Prices on Application

AMERICAN FOUNDRY & FURNACE CO.

BLOOMINGTON, ILLINOIS

Detroit Packless Radiator Valves



For steam or hot water heating in both gravity and vacuum systems.

They have a distinctly new packless construction which will be tight and will never leak around the stem.

The valves in all sizes are symmetrically proportioned, with a smooth satin finish on the metal surface, never before approached in radiator valve construction.

The highly finished mahogany handles are protected from damage by a cloth bag, which is not removed until after installation and completion of the decorating.

Handles are large, easy turning, without possibility of the hand coming in contact with hot metal.

DETROIT LUBRICATOR COMPANY

DETROIT, U.S.A.

Largest Manufacturers of Radiator Valves in the World

Trouble—Free

Know Genuine Jenkins Valves by the Jenkins "Diamond Mark"

A heating system is no more satisfactory than the radiator valves.

The Jenkins Radiator Valve is not an ordinary radiator valve—it contains more metal, is of a stronger construction throughout, especially at points where the strain and pressure is greatest.

It cannot leak—the bonnet is large, with ample room for packing (it is furnished ready packed.)

The Jenkins renewable composition disc, with which all globe, angle, offset and corner valves are fitted, forms a perfect contact on the seat.

A Manganese bronze spindle with deep, even threads make the opening and closing operation easy.

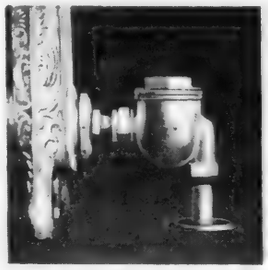
The union makes the valve easy to install. For a job of lasting satisfaction use Genuine Jenkins Radiator Valves.

JENKINS BROS.

New York Montreal Chicago
Philadelphia Boston London

Jenkins Valves

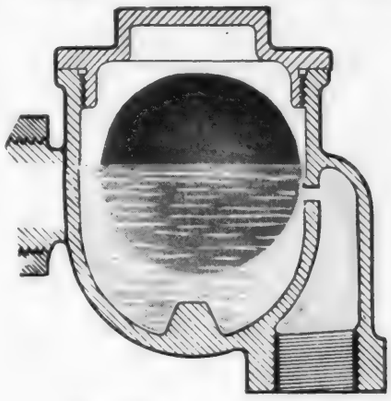
2071-J



A hollow sphere

Made of copper and free to float—about 60% submerged.

against the submerged outlet



Blocks the flow of steam, but allows water to pass when the water itself rolls the ball up.

THE hollow sphere in the *Johns-Manville Radiator Trap* has nothing to do but float—away from or over the outlet—depending on whether or not there is water to be discharged.

But it always holds back the steam, regardless of pressure or heat. And because the Johns-Manville Radiator Trap operates positively, regardless of temperature—there are no adjustments to make, either before or after installation.

This simplicity saves work for you, insures easy operation and the minimum of wear.

H. W. JOHNS-MANVILLE CO. New York City

10 Factories—Branches in 63 Large Cities

For Canada,
Canadian Johns-Manville Co., Ltd., Toronto

Through—

Asbestos

and its allied products

JOHNS-MANVILLE
Serves in Conservation

Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Prevention Products

JOHNS MANVILLE
Radiator Trap

should any union, or the members of any union, violate this agreement, and the violation is not discontinued within one week from the time of notice of said violation is sent to the Building Trades Council, it shall not be considered a violation if the Building Trades Employers' Association, or any member or members thereof, proceed to man the work with such men as can be secured, or, in case of such violation, if the Building Trades Employers' Association locks out the members of the defaulting union, or declares a general cessation of work.

"It is further agreed that if workmen not members of the unions parties hereto are alleged to be employed on any job whereon any member or members of the Building Trades Employers' Association are doing work, it shall be brought immediately to the attention of the Board of Arbitration hereinafter provided for, and if the facts are found by said board to be as alleged it shall not be deemed a violation of this agreement for any members of the unions above mentioned to refuse to work on the job in question, unless such workmen are justifiably employed in the case above provided for; that is, where a union, or a number of members of the union, have first violated this agreement."

The agreement provides for a permanent Board of arbitration made up of five employers and five employees.

NOVEMBER BUILDING OPERATIONS, compiled by the F. W. Dodge Company, show that the total amount of building contracts awarded north of the Ohio and east of the Missouri amounted to $221,450,000, which is 29% less than the figures for October. Of the total amount for October, 32% or $71,267,000 was for residential buildings, 32% or $70,222,000 was for industrial buildings; 15%, or $33,878,000 was for business buildings; and 10%, or $21,451,000 for public works and utilities. The November figures brought the total for contracts awarded for the first eleven months of 1919 up to $2,332,902,000. The total for the first eleven months of 1918 amounted to $1,631,929,000, 33% of which was for government work. The Philadelphia, Baltimore and Washington districts were the most active of the Eastern districts, while the Pittsburgh district, with its figures of $42,270,000, had a total for the year up to that time of $383,322,000, some $30,000,000 more than the total for the entire year of 1918. The central west, comprising Illinois, Indiana, Iowa, Wisconsin, Michigan had on December 1 a gross total of nearly twice the volume for 1918. In the northwest, including Minnesota and North and South Dakota, the figures were almost as favorable.

Central Station Heating Notes.

TUSCOLA, ILL.—A number of business firms in Tuscola, as well as others who are dependent upon the steam supply of the Central Illinois Public Service Company are up in arms over the size of the bills being rendered for heating service. Up to last year the company's practice was to charge for heating service on a flat rate. Last year, on an order of the State utilities commission, a meter service was installed. The bills, it is stated, have in some cases run as high as $60.00 per month for a cottage of an ordinary size. Mayor Land has advised the people to refuse to pay such bills and has appealed to the utilities commission for relief.

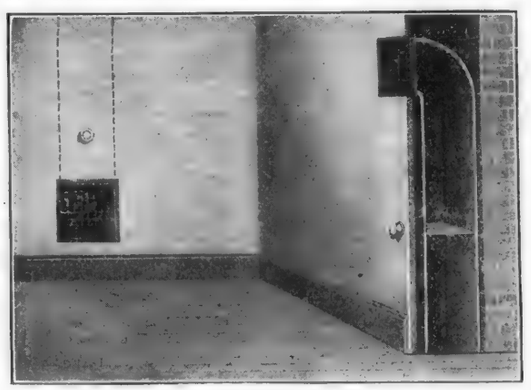
SPRINGFIELD, MO.—A motion for a rehearing on the application of the Springfield Gas & Electric Company for increased steam heating rates, which was favorably acted on recently by the State public service commission, has been overruled. Protestants of the increased rate will now have to take the case to the higher courts or allow the present increased rates to stand. The increases were granted by the public service commission last August, over the protest of several of the company's large consumers. These consumers immediately filed an application for a rehearing, which has resulted as stated.

A compromise on the first application of the company for increased rates was reached when the former rates of the company were increased 25%. These increased rates were to continue until May 31, 1919. After this period expired the

Unauthorized Tampering with the Air Duct Dampers

is prevented by the

PERFECTO DAMPER REGULATOR and INDICATOR



May be placed on the wall where the ventilating ducts are concealed and the damper connected to it by an extension of the square damper rod. Cannot be altered except by person in charge. Especially useful in schoolrooms.

Send for bulletin giving further particulars

THE SIXTH CITY SHEET METAL WORKS CO., Cleveland, O.

Galvanized Iron Work for Heating and Ventilating Systems

Fast Turn-over at Good Profit

Send for Our Dealer Proposition

I am the "Little Draft-Man"

I Am a simple but infallible furnace regulator, and I never get out of order. When my regulator is set at night I open the furnace damper and close the check, causing the fire to send genial warmth into the home.

This enables my owners to get up in a warm house when it's cold. I save them trouble and help them economize their fuel. I go on old or new furnaces of any make—steam, warm air or hot water, and I can be installed by anybody in a few moments,

Because I am what I am, I appeal to buyers the minute my workings are explained. I am, therefore, popular with dealers as a source of profit.

I sell or $15 to home folks, but dealers buy me for much less. My story is told in print and my advantages and prices to dealers go to all who ask for it. I am manufactured by the

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35 Ottawa Avenue, N. W. Grand Rapids, Michigan

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by installing our

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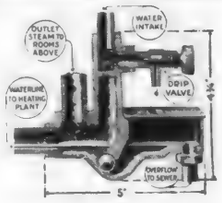


Used on Furnaces, Hot Water or Steam Boilers.
Practically Self Operating.
Does away with Filling Furnace or Radiator Water Pan.

If your jobber will not supply you, write direct.

ONWARD MFG. CO., Menasha, Wis.

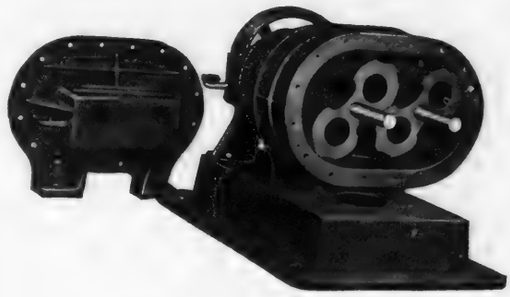
STATE LAWS AND MUNICIPAL REGULATIONS
require that all public buildings be uniformly heated

Cleveland Pyrometers

accurately indicate or record the temperatures of the various rooms, outside atmosphere, etc., at a central point in the boiler room, custodian's office or wherever desired. The use of a CLEVELAND PYROMETER installation in addition to adding to the comfort of the occupants will aid the engineer or fireman in reducing the fuel bills.

THE CLEVELAND INSTRUMENT CO.
Electrical Measuring and Recording Instruments
CLEVELAND, OHIO

The Heart of Connersville Vacuum Cleaners



The vacuum producer is the heart of a vacuum cleaning system for it determines the cleaning results and the cost of operation. No system can be considered successful unless it gets the best cleaning results with the minimum of power consumption.

Connersville Vacuum Cleaners are the only cleaners using the celebrated "Connersville" double impeller rotary blowers. Particular engineers choose "Connersville" blowers. This speaks for their excellence without question.

Best by Test

Exhaustive tests by the U. S. Supervising Architect proved the superiority of the rotary blower over all other types of vacuum producers for getting the best results with the least consumption of power.

Connersville Vacuum Cleaners are made in all sizes. Standard machines can be selected for all ordinary uses. For special conditions machines can be furnished to meet any given specifications. When you specify a "Connersville" you specify the best.

United Vacuum Appliance Division
of Landers, Frary & Clark
CONNERSVILLE INDIANA
Dept. C

company field application to have the rates continue after the time designated by the compromise agreement. Since that time the case has been in the hands of the public service commisison continually. As matters stand at present the commission grants an increase by confirming the original order issued in August. The rates in existence last season carried a surcharge of 25% over the previous old rates, making the rates 75 cents per 1000 lbs. for the first 10,000 lbs. of steam used and gradually decreasing according to the quantity used, down to approximately 50 cents per 1000 lbs.

The new rates are as follows:

First 10,000 lbs. of condensation per month, per 1000 lbs $1.00; next 30,000 lbs. per month per 1000 lbs., 90 cents; next 60,000 lbs. per month per 1000 lbs., 80 cents; next 100,000 lbs. per month per 1000 lbs., 70 cents; next 300,000 lbs. per month per 1000 lbs., 60 cents; for all in excess of 500,000 lbs. per month per 1000 lbs., 50 cents.

In addition to the above rates for steam furnished, there is a service charge of 8 cents per square foot of radiation per season up to 10,000 sq. ft. and 4 cents per square foot for all above 10,000 sq. ft. of radiation. There is a 5% discount for prompt payment.

Steam for heating is furnished by the company to the large buildings on the public square, St. Louis Street and Jefferson Street, and in addition to several small business houses.

Manufacturers' Notes.

TRANE Co., La Crosse, Wis., manufacturers of the Trane line of heating specialties, has arranged with the Plant Engineering & Equipment Co., 11 John Street, New York, to act as its New York representative.

MAGEE FURNACE Co., Boston, Mass., which has been in business in Boston for the past half century, has been incorporated as the Magee Furnace Co., Inc., with a capital stock of $600,000. Plans for the expansion of the business are now under way. The officers are: President and treasurer, Alfred F. Stockbridge; vice-president, S. O. Field.

COON-DEVISSER Co., Detroit, Mich., announces that John E. McDonald, formerly Chicago manager of the Vapor Heating Department of the Illinois Engineering Company has become associated with the Coon-DeVisser organization. Mr. MacDonald is known as one of the pioneers in the development of apparatus designed for vapor and vacuum heating. In 1899 he joined the organization of D. F. Morgan & Co., Chicago, remaining with that company until the Morgan heating system patents were taken over by the Kellogg-Mackay-Cameron Co., of Chicago, when he took charge of the heating specialties department of that company. In 1905 he became associated with the late Byron E. Van Auken of the Consolidated Engineering Company, and in 1910 joined forces with the Illinois Engineering Company and had a part on the development of that company's vapor system of heating.

VULCAN SHEET METAL & MFG. Co., 45 Fulton St., New York, is installing the system for conveying the grindings in the new plant of the Norma Company of America, manufacturers of ball bearings, recently erected in Long Island City. American Blower Company's apparatus was used.

JENKINS BROS., New York, announce that negotiations have been completed for a material increase in the company's manufacturing facilities by owning and operating a plant in Bridgeport, Conn. This plant will be devoted entirely to the manufacturer of the Jenkins valve, an engineering product first placed on the market in 1865 when Nathaniel Jenkins invented and introduced the renewable disc type of valve. The heirs of the founder of the business continue to hold a controlling interest in the company, the president being Farnham Yardley, a son-in-law of the late Alfred B. Jenkins. The vice-president is Frank T. Swain who has been connected with the company since 1879. It is expected that Charles V. Barrington, who has had a wide experience in the manufacture of valves, will also be elected a vice-president and placed in charge of the Bridgeport plant. The manufacture of the Jenkins discs, sheet packings, pump

Engineers and contractors will find our new publication describing Bicalky fans and air washers of interest. Write today for your copy; no obligation attached.

Hersh & Brother, Allentown, Pa.

"Sirocco"
TRADE MARK

Interior View of Sirocco Equipment of Buick Motor Co., Flint, Mich.

Conditioned Air in the Automotive Industry

Manufacturers of automobiles and automobile accessories are considered among the leaders in the application of heating and ventilating and air conditioning in their plants.

The installations they have made have been based upon careful study of the conditions as applied to the employe as well as the general manufacturer. They have found that in order to keep production up to the necessary standard, workers must be supplied with clear, pure air.

The view above illustrates "Sirocco" Air Conditioning equipment installed at the Buick Motor Car Company at Flint, Michigan. With this method the air is washed of all impurities and sent out into the factory heated to the proper degree for comfort in the winter and cooled to the right temperature during the summer months.

Air conditioning equipment is only a part of a number of heating and ventilating products bearing the "Sirocco" mark. If you have a problem that involves ventilating or air conditioning especially, we would like to have you get in touch with us.

AMERICAN BLOWER COMPANY, Detroit, Michigan

Branches in all large cities

**Canadian Sirocco Company, Ltd.
Windsor, Ont.**

valves and other mechanical rubber goods, will be continued at Elizabeth, N. J.

To take care of its rapidly increasing Canadian business, the Canadian branch of the company, Jenkins Bros., Ltd., of Montreal, has recently completed alterations and additions to its brass valve department and now has in course of construction a new 192 ft. x 80 ft. iron valve foundry.

AMERICAN RADIATOR Co., Chicago, Ill., has appointed Ray M. Stackhouse manager of the company's Kansas City branch. Mr. Stackhouse has been connected with the Chicago office for several years and has a wide acquaintance in the heating trade in that section. Frank Miller, also of the Chicago office, has been appointed manager of the company's Milwaukee branch. In the Chicago office Milo S. Dillman has been made assistant manager, and Donald M. Forgan, assistant to the manager in charge of Chicago city sales. Herman A. Voss succeeds Mr. Miller in the Promotion Department, while Homer R. Linn will have charge of a new department known as the Industrial Sales Department. The Architectural Department is now in charge of Henry B. Roney.

New Firms and Business Changes.

FERDINAND J. FRIEDMAN, who has been serving as captain in the Ordnance Department, stationed at Fort Sill, Okla., has returned to his practice in New York as heating and ventilating engineer. Mr. Friedman's offices are at 105 West 40th Street. He will handle both engineering and contracting work in heating, ventilating and power plants.

STUREMAN-BUTTRICK Co., Springfield, Ill., has been formed as engineers and contractors for the design and construction of heating, ventilating and refrigerating systems, boilers and power plants. The firm is composed of Robert V. Stureman, who was for several years engineer and superintendent of the Springfield Gas and Electric Co. and other properties of the Hopendyl-Hardy Co., of New York. During the war he was supervisor of heating design and construction for the United States Army at various military camps throughout the country. Charles B. Buttrick, the other member of the firm, is an expert of many years' experience.

WESTINGHOUSE, CHURCH, KERR & Co., INC., New York announces the appointment of Russell W. Stovel as a consulting engineer for the company. Mr. Stovel was until recently lieutenant-colonel in the Engineers' Corps, United States Army, serving as chief of the Terminal Facilities Division of the Army Transport Service in France. Previous to his army service, he had been engaged in mechanical and electrical problems connected with central power station and steam railroad electrification work, as well as in the mechanical handling of freight at water terminals. Mr. Stovel will devote his entire time to the electrical and mechanical features of the work of Westinghouse, Church, Kerr & Co.

WATERTOWN, N. Y.—George W. Taylor, a well-known steam fitter of Watertown, Edward Clobridge and Chester Stieve, have organized a heating and plumbing and contracting business in that place, with offices at 405 Stone Street. Mr. Taylor has the distinction of being the only colored member of the United Association of Plumbers.

New Incorporations.

DAYTON FAN & MOTOR Co., Dayton, O., capital $700,000 to take over the business operated under the same name. It is planned to increase the output 750 units per day. To provide the necessary manufacturing facilities, the company is building a five-story building, of reinforced concrete, for the manufacture of fans and small electric motors for all purposes.

The Progress of Fuel Oil on the Atlantic Seaboard.

Recent estimates show that several million tons of coal have been displaced by fuel oil in New England

The Fellow Who Says,
"What You Don't Know Won't Hurt You,"
may be Right in a Dairy Lunch,
but He's all Wrong in Business.

Isn't He?

Then, so that you may know the story of Manufactured Weather in Modern Industry, write to me today and ask me to send you a copy of my new book "Weather." It's gratis, of course, and I'm right proud of the way in which my thousands of friends have received it. They say it tells 'em the real dope without a lot of technical camouflage.

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Yours to make

"Every day a good day"

The Mechanical Weather Man

Buffalo
Equipped
THE prominent buildings in all parts of the country are equipped with
Buffalo Heating and Ventilating Apparatus
It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.
Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.
Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities
"Buffalo"

out of the total annual coal requirements of 60,000,000 tons in that section. It is stated that his displacement of coal refers only to industrial users, and does not include domestic consumers.

According to the *Journal of Commerce*, New York, the number of oil companies organized during November was 141, their aggregate authorized capital being $490,760,000. This brings the total indicated investment in the petroleum industry during the first eleven months of 1919 to $3,207,797,000, distributed among 1448 companies.

It was reported by the *Wall Street Journal*, under date of December 4, 1919, that the Atlantic coast oil refineries are turning out approximately 111,000,000 gal. of oil a month, compared with 93,000,000 gal. during 1918.

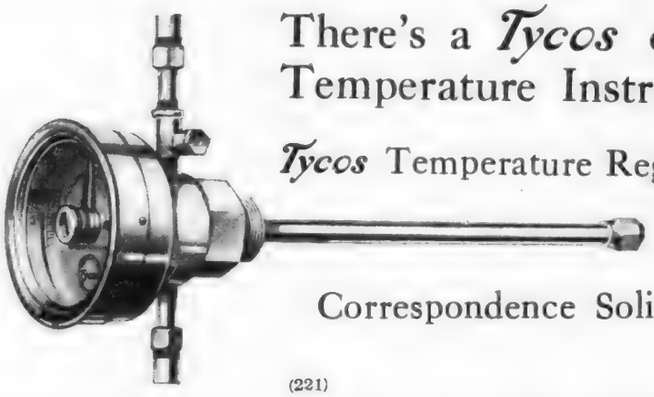
Serious Fire at Plant of Pierce, Butler & Pierce Manufacturing Corporation

Flames practically destroyed the $1,000,000 plant of the Pierce, Butler & Pierce Mfg. Corporation, at Eastwood, near Syracuse, N. Y., December 19. The known loss is between $500,000 and $600,000. Eleven hundred employees of the company and of the W. A. Schleit Mfg. Co., adjoining, are thrown out of work.

WANTED.

Wanted—By New York heating contractor, designer and estimator of experience, capable of handling heating, ventilating and power layouts. In replying state age, salary expected and include references. Address Murray, care of HEATING AND VENTILATING MAGAZINE.

Position Wanted—As superintendent of steam, hot water, ventilating and power plant construction. Thoroughly familiar with all modern appliances and systems of the industry. Estimating, laying out and drawing. Address F. S. Graham, 50 Clinton St., Newark, N. J.



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Temperature Instrument for Every Purpose

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Heating
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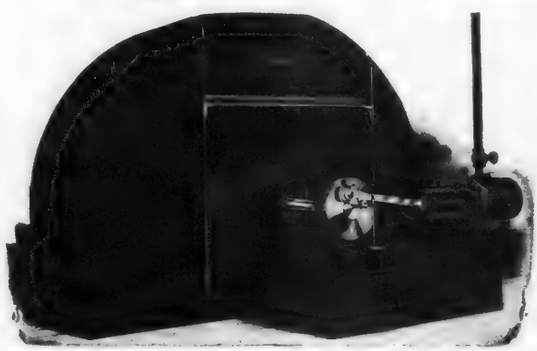

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For hotel ventilation Massachusetts Squirrel Cage Fans have long been the choice of the leading engineers and contractors. In many of the best known hotels in the country you will find these fans used both for ventilation and heating.

In the Martin Hotel, Sioux City, Ia., H. L. Steven & Company, Architects and Engineers, Massachusetts Fans help to keep the air pure and clean.

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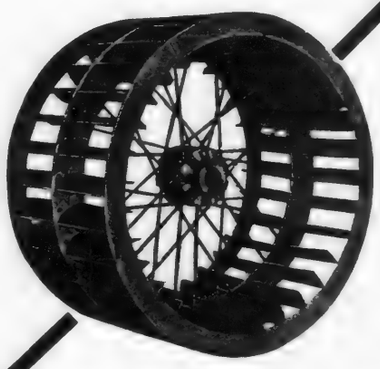

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—for Efficient Heating and Ventilation

Applied to modern heating and ventilating requirements, Bayley Equipment, as represented by The Chinook Heater and the Bayley Plexiform Fan, gives a KIND and LENGTH of service that makes it a highly profitable investment.

Our engineers will gladly aid you in planning heating installation for buildings of all kinds.

Write for descriptive bulletins, plans and estimates.

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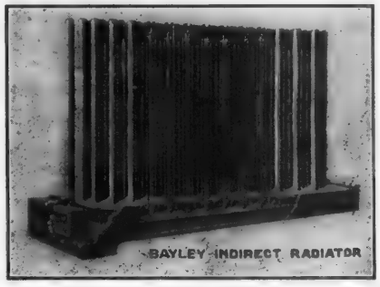
732 Greenbush St., Milwaukee, Wis.

Manufacturers of Heating, Ventilating, Drying and Exhausting Apparatus



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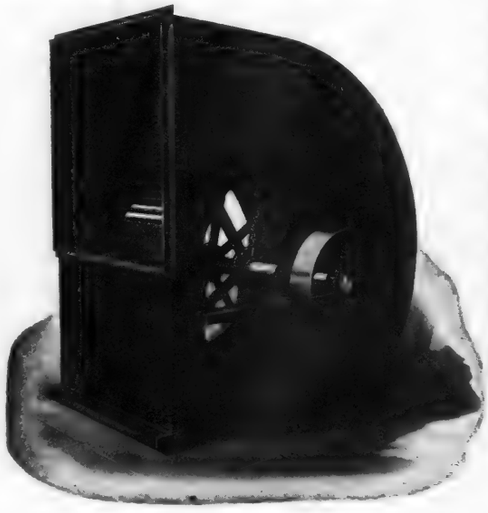
are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



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Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

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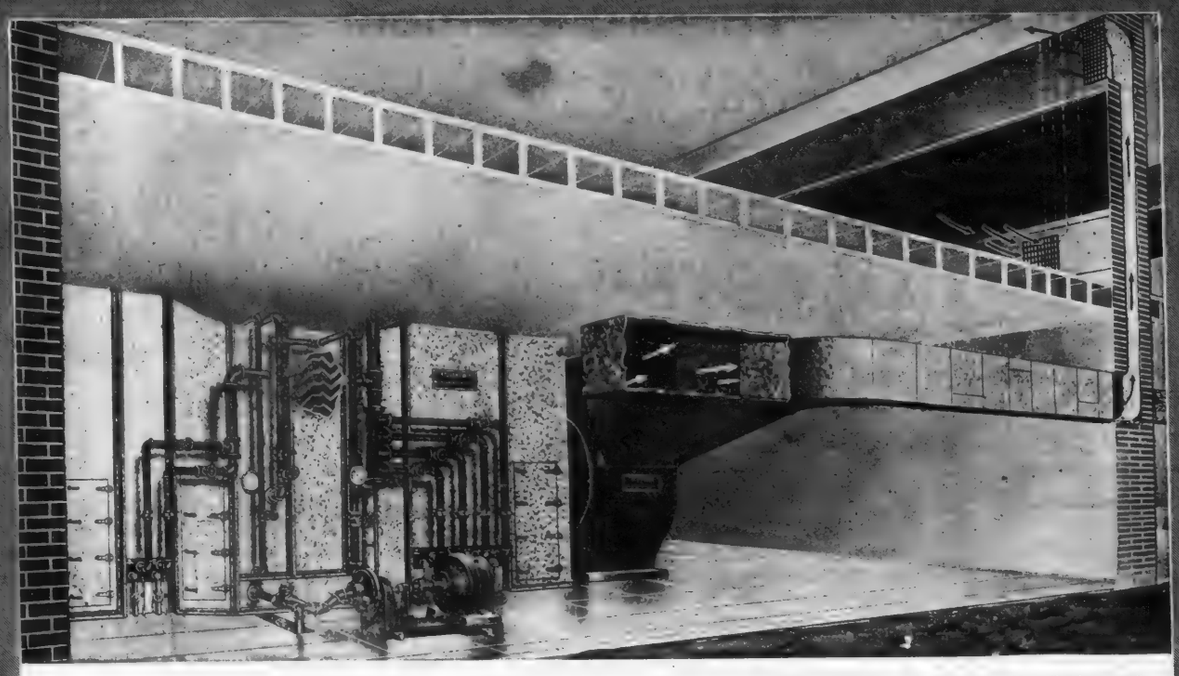
We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

Write us

BUCKEYE BLOWER CO.

COLUMBUS, OHIO.



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Speed Up!

PRODUCTION—PROFITS—HEALTH

Clean, purified factory air keeps employees healthy and contented. Satisfied workmen are more efficient. They produce more and better work, which yields larger dividends for manufacturers.

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HEATING—VENTILATING—AIR CONDITIONING
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—insure a positive and constant supply of purified air, heated, cooled, humidified, or dehumidified—as required. The ideal manufacturing condition in *any* plant can be reproduced *every* day in the year by Sturtevant systems, which operate irrespective of outside weather conditions. All systems are scientifically designed to the needs of the plant.

The refinements in design, material, and construction of Sturtevant Fans, Heaters, Air Washers and driving apparatus account for the continuous dependability and operating economy of Sturtevant Heating, Ventilating, and Air Conditioning systems. Request our engineering department to make a study of your plant and submit a plan and an estimate of your requirements. No obligation incurred For your convenience twenty-three Sales Engineering branches are maintained in the leading business centers. Bulletins of specifications, apparatus, and installations on request.

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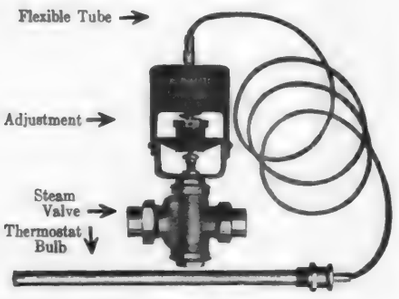
Eliminate the Human Element from heat control by specifying the

Powers Heat Regulator



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Wherever there is a need for maintaining a definite, even temperature the Powers Automatic Heat Regulator is your answer. The regulator shown at the right is the Powers No. 11B. It is now used in thousands of factories and homes. Fully described in our Bulletin 129. This is only one of the many types of Powers Regulators, some of which will exactly meet your requirements. Allow our more than 30 years of experience to be of service to you in your problem.

The Powers Bulletins contain accurate information on heat control, and complete details of Powers Regulators. They are yours for the asking.

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Specialists in Automatic Heat Control

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and other PRESSURE REGULATORS
for all conditions of service
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The "CHICAGO"
AUTOMATIC CONDENSATION PUMP AND RECEIVER

The only Condensation Pump fitted with a horizontal TILTING TANK RECEIVER containing no troublesome floats. The automatic apparatus is positive in its action. The pump is equipped with two out board ring oiled bearings, one on each side of the casing, insuring a constant and proper oil lubrication at all times.

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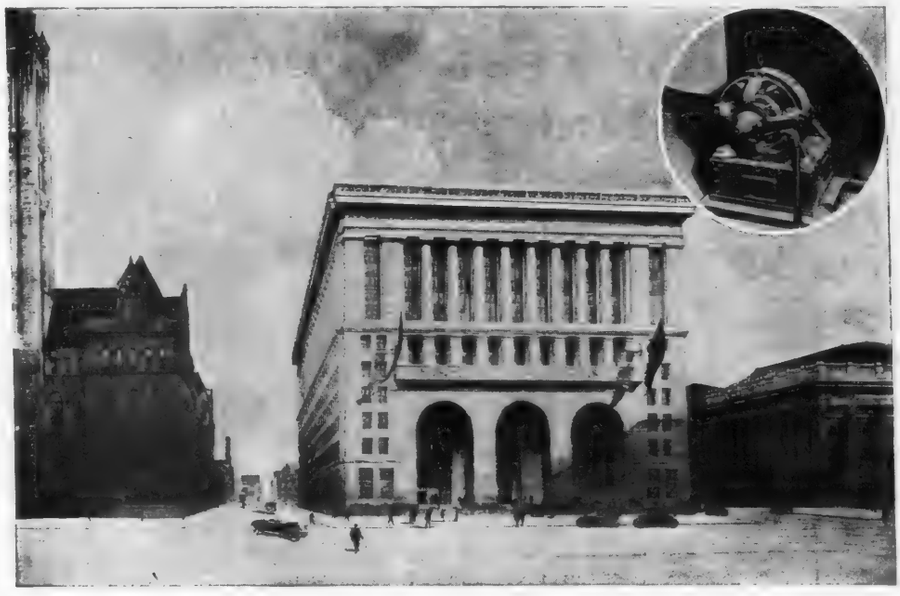

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Motors and Control for Ventilating Equipment

In all large public buildings, including hotels, office and government buildings, dependable ventilating systems are a necessity. The systems must be not only correct in design but must also be sufficient in capacity, reliable and quiet in operation and economical in up-keep.

Today, Westinghouse electric drive for ventilating equipment is operating in many of the largest buildings in the world. This equipment meets the rigid requirements of architects, heating and ventilating engineers and contractors.

It will be worth your while to consider the use of Westinghouse ventilating equipment in connection with your next proposition.

Write for a copy of our Electrical Ventilating Equipment Circular No. 7193.

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Meet that Peak Demand for Hot Water

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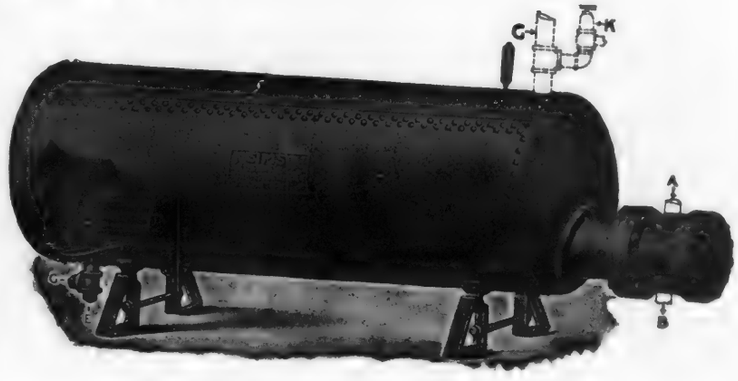
Sims Clean E-Z Steam Tube Heater

For hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools, etc.



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Especially Designed for Supplying Large Quantities of Hot Water

Send for tables showing heat capacities using steam at various pressures

"We keep others in hot water" **THE SIMS CO., 18th St., Erie, Pa.**

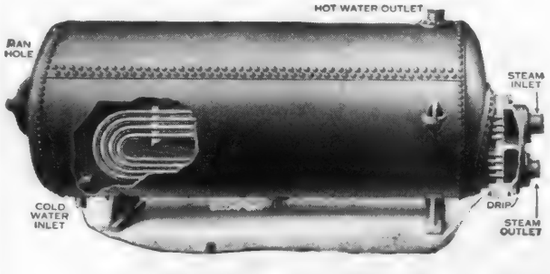
IT MAKES NO DIFFERENCE

how, when or where **hot water** is wanted--

The Patterson System of Water Heating

will furnish it-*all required and instantly*-with the highest efficiency and top-notch results all of the time.

'Peak Demands', regular or continuous demands, emergencies, etc., are all the same to **The Patterson**



Hot Water authorities, operators, plant owners, etc. all recognize the absolute reliability of it.

Why not let our own Water Heating Engineers confer with you when you are up-a-gainst **hot water** problems. Their long experience possibly may be of some value.

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Straight Tubes

Separate Channels

Plain Covers

Built in Vertical or Horizontal Patterns

Temperature Control Furnished if Desired

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The shell, tube heads, water channel and covers are made of cast iron, assuring least possibility of corrosion and as the brass tubes are straight, and smooth, the friction loss is reduced to a minimum.

Frequent temperature expansion of the tubes, due to intermittent service, is taken up by the Floating Head, thereby eliminating the possibility of tube breakage. The use of separate water channel permits of ready access for cleaning purposes without the breaking of any pipe connection and also permits convenient tube replacement in the event of accident. Straight tubes avoid the necessity of removing any but the damaged tubes in event of replacement.

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Whitlock heaters are designed for an infinite variety of uses. They are used for heating feed water, hot water for forced circulation, hot water for industrial purposes, wash water, fuel oil, molasses, for de-alcholization, for solvent vapour recovery, for cooling condensation, for economizing heat in spent liquors and for a thousand other purposes.

No matter what duty is required of a tubular heat exchanging device Whitlock will design a heater of the most suitable type for that exact duty.

THE WHITLOCK COIL PIPE CO.

HARTFORD, CONN.

Whitlock Heaters have everlasting copper tubes.

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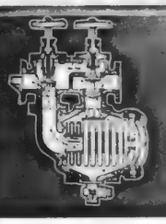

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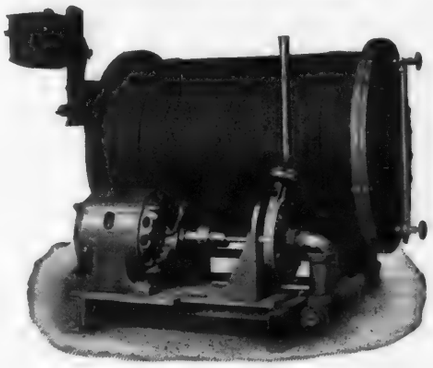

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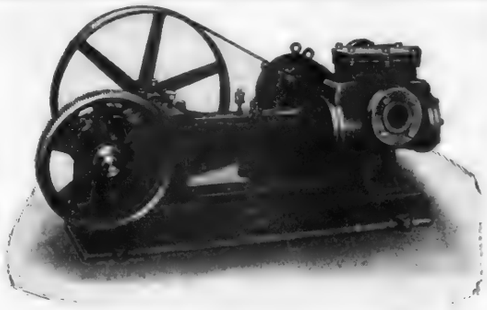

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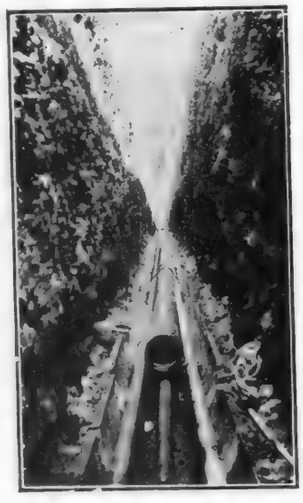

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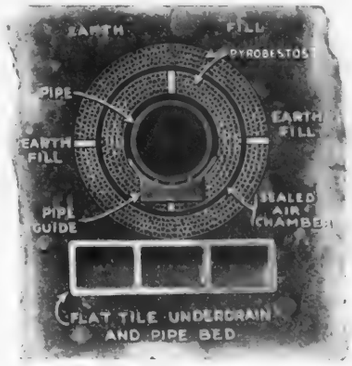

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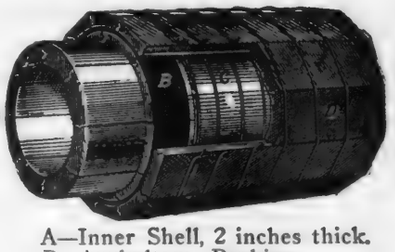

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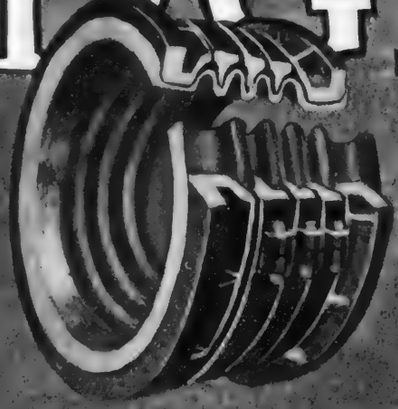

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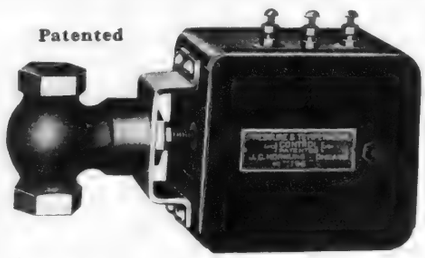

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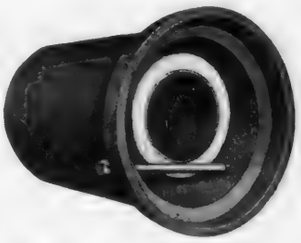

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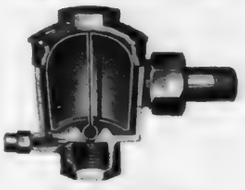

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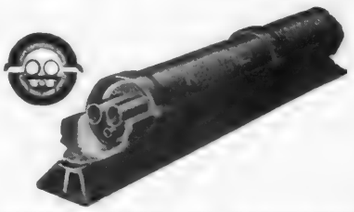

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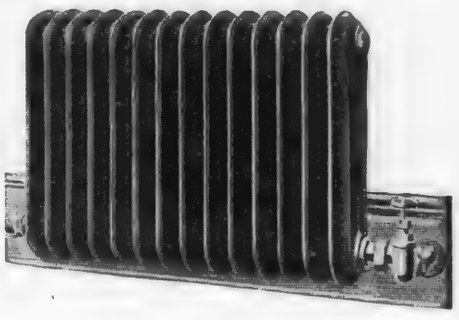

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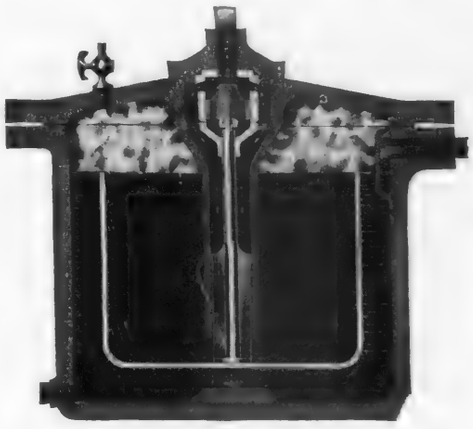

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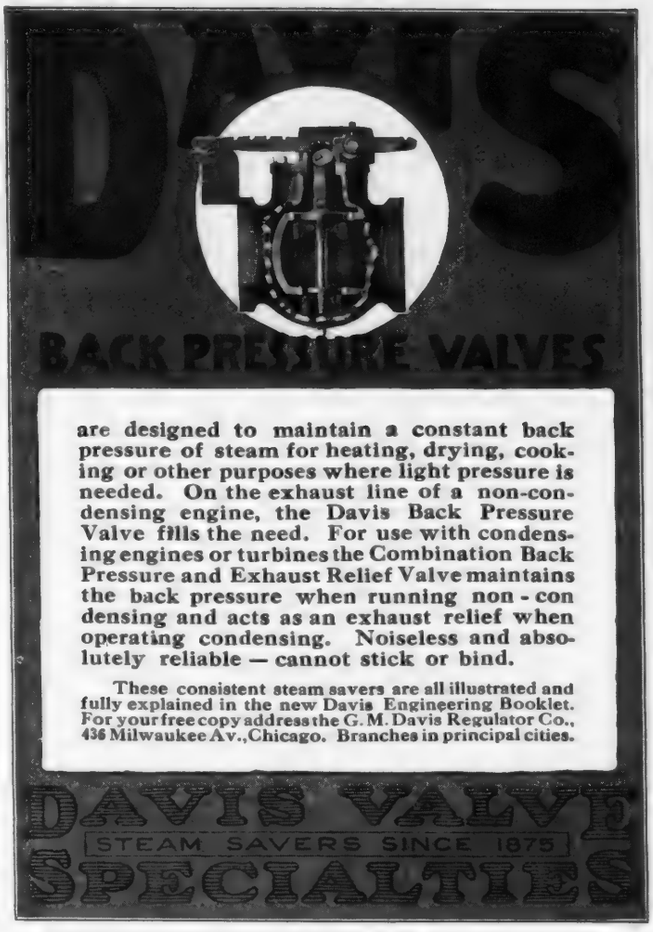
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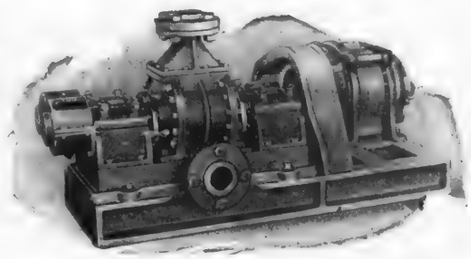

Showing installation of Skinner Heaters in garage of Anheuser-Busch Brewing Ass'n, St. Louis, Mo. Note extensive area served.

Heat your Plant at least cost

The Skinner Bros. (Baetz Patent) Heating System provides a constant and uniform distribution of heat, at less cost, than any known system now in use.

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The Skinner Bros. (Baetz Patent) Heating System consists essentially of a large steam pipe coil compactly mounted above a centrifugal fan wheel, both housed as a single unit within a heavy structural and sheet-steel casing.

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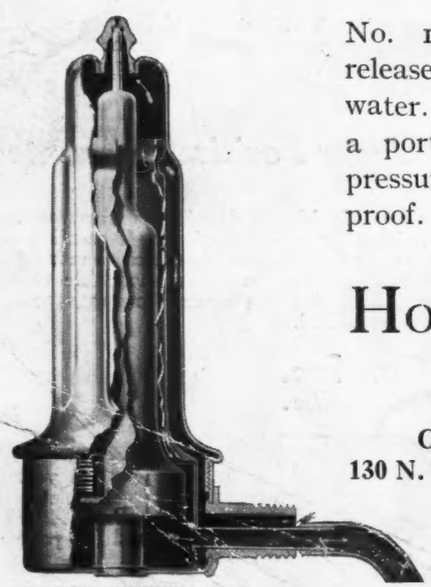

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out of the total annual coal requirements of 60,000,000 tons in that section. It is stated that his displacement of coal refers only to industrial users, and does not include domestic consumers.

According to the *Journal of Commerce*, New York, the number of oil companies organized during November was 141, their aggregate authorized capital being $490,760,000. This brings the total indicated investment in the petroleum industry during the first eleven months of 1919 to $3,207,797,000, distributed among 1448 companies.

It was reported by the *Wall Street Journal*, under date of December 4, 1919, that the Atlantic coast oil refineries are turning out approximately 111,000,000 gal. of oil a month, compared with 93,000,000 gal. during 1918.

Serious Fire at Plant of Pierce, Butler & Pierce Manufacturing Corporation

Flames practically destroyed the $1,000,000 plant of the Pierce, Butler & Pierce Mfg. Corporation, at Eastwood, near Syracuse, N. Y., December 19. The known loss is between $500,000 and $600,000. Eleven hundred employees of the company and of the W. A. Schleit Mfg. Co., adjoining, are thrown out of work.

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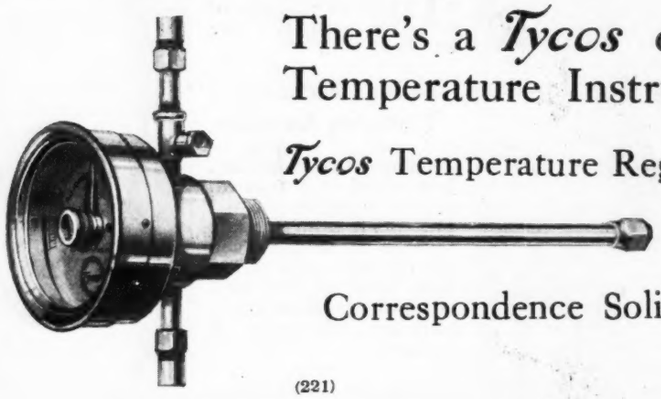

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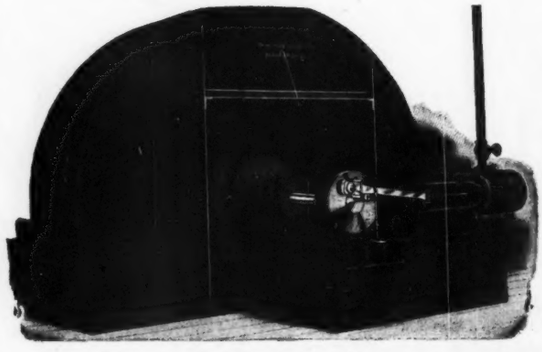

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